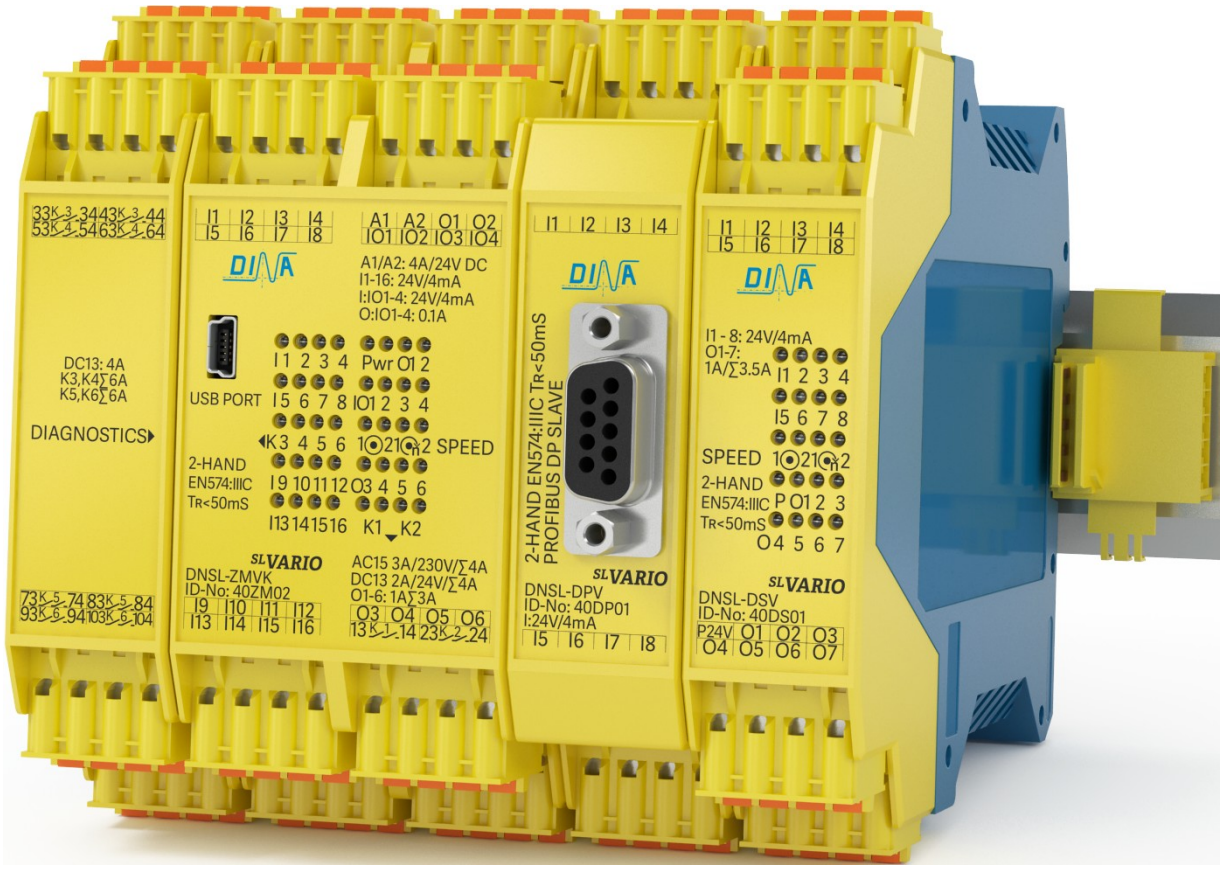
SLVARIO

Original Instruction Manual



we are safety.

EU-Konformitätserklärung	EU declaration of conformity	DIVA
Déclaration UE de conformité	Dichiarazione di conformità UE	Declaración UE de conformidad

Die nachfolgend aufgeführten Produkte sind konform mit den Anforderungen der folgenden Richtlinien
The beneath listed products are in conformity with the requirements of the following directives
Les produits mentionnés ci-dessous sont conformes aux exigences imposées par les directives suivantes
I prodotti sotto elencati sono conformi alle direttive sotto riportate
Los productos listados a continuación son conforme a los requisitos de las siguientes directivas

Maschinenrichtlinie	2006/42/EG	EMV Richtlinie	2014/30/EU	RoHS-Richtlinie	2011/65/EU
Machinery directive	2006/42/EC	EMC Directive	2014/30/EU	RoHS Directive	2011/65/EU
Directive Machines	2006/42/CE	Directive de CEM	2014/30/UE	Directive de RoHS	2011/65/UE
Direttiva Macchine	2006/42/CE	Direttiva EMV	2014/30/UE	Direttiva RoHS	2011/65/UE
Directiva de máquinas	2006/42/CE	Directiva CEM	2014/30/UE	Directiva RoHS	2011/65/UE

Folgende Normen sind angewandt:	a	• EN 55011: 2009+A1: 2010 (class A)
Les normes suivantes sont appliquées:		• DIN EN 61326-1: 2013-07
Vengono applicate le seguenti norme:		• DIN EN 61326-3-1: 2015-06
Se utilizan los siguientes estándares:		• DIN EN 61000-6-2: 2016-05
DGUV Test ET 17079 Sicherheit geprüft tested safety CE	b	• DIN EN 60947-5-1: 2015-05
	c	• DIN EN ISO 13849-1: 2016-06
	d	• DIN EN ISO 13849-2: 2013-02
	e	• DIN EN 574, Type IIIC: 2008-12
	f	• DIN EN ISO 13856-1:2013-08 / -2:2013-08 / -3:2013-12 Nur für Signalverarbeitung
		For signal processing only
		Dokumentenbeauftragter: Dirar Najib, Geschäftsführer
		Authorized person : Dirar Najib, General Manager

Zusatzanforderung: Supplementary requirements:	• DGUV Test: GS-ET-20: 2016-10 • DIN EN ISO 9001: 2015

• EG-Baumusterprüfbescheinigung: ET 17078 vom 01.09.2017 • DNSL-NIV und DNSL-SIV, Kategorie 3, PLd, nicht für Zwei-hand Funktion • Alle weiteren Module Kategorie 4, PLe Unter Anwendung der Tabelle 3 der DIN EN 13849-1: 2016-06 entspricht dies einem SIL 3.	• EC-Type Test certificate: ET 17078 from 2017-09-01 • DNSL-NIV and DNSL-SIV, Category 3, PLd not for tow-hand function • All other modules Category 4 PLd Using table 3 of DIN EN 13849-1: 2016-6 this is conform to SIL 3

	SL VARIO:		
Bezeichnung der Bauteile	DNSL-ZMV, DNSL-ZMVA DNSL-ZMVD, DNSL-ZMVK	Zentralmodule	Central modules
Description of components	DNSL-DSV, -DSV2, DSIV, -DRV, -SIV	Drehzahlüberwachungen	Speed monitoring
Description des composants	DNSL-INV, -IOV, -RMV	Ein- Ausgangsmodule	In- output modules
Descrizione dei componenti	DNSL-CMV	Kaskadenmodul	Cascade module
Descripción de componente	DNSL-NIV, DNSL-NRV	Netzwerk Module	Network modules
	DNSL-COV, -DPV, -ECV, -EPV, -MOV, -PLV, -PNV	Feldbusmodule	Field bus modules

Notifizierte Stelle		DGUV TEST, Prüf- und Zertifizierungsstelle, Elektrotechnik
Notified body	Organismo notificato	Fachbereich: ETEM
Organismo notificado	Organisme notifié	Gustav-Heinemann-Ufer 130/ 50968 Köln/ Germany
		Kenn-Nummer: 0340

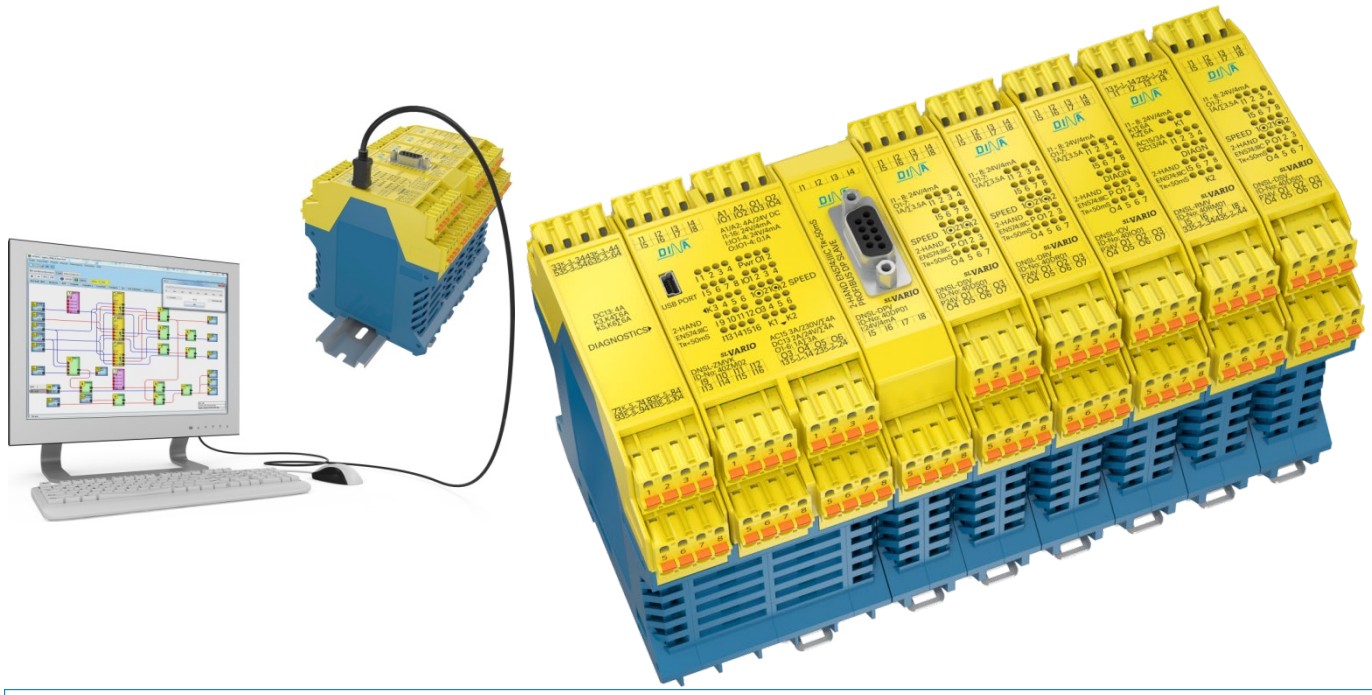
Dokumentenbeauftragter	Authorized person	Dirar Najib, Geschäftsführer / CEO
		Esslinger Str. 84/ 72649 Wolfschlugen/ Germany

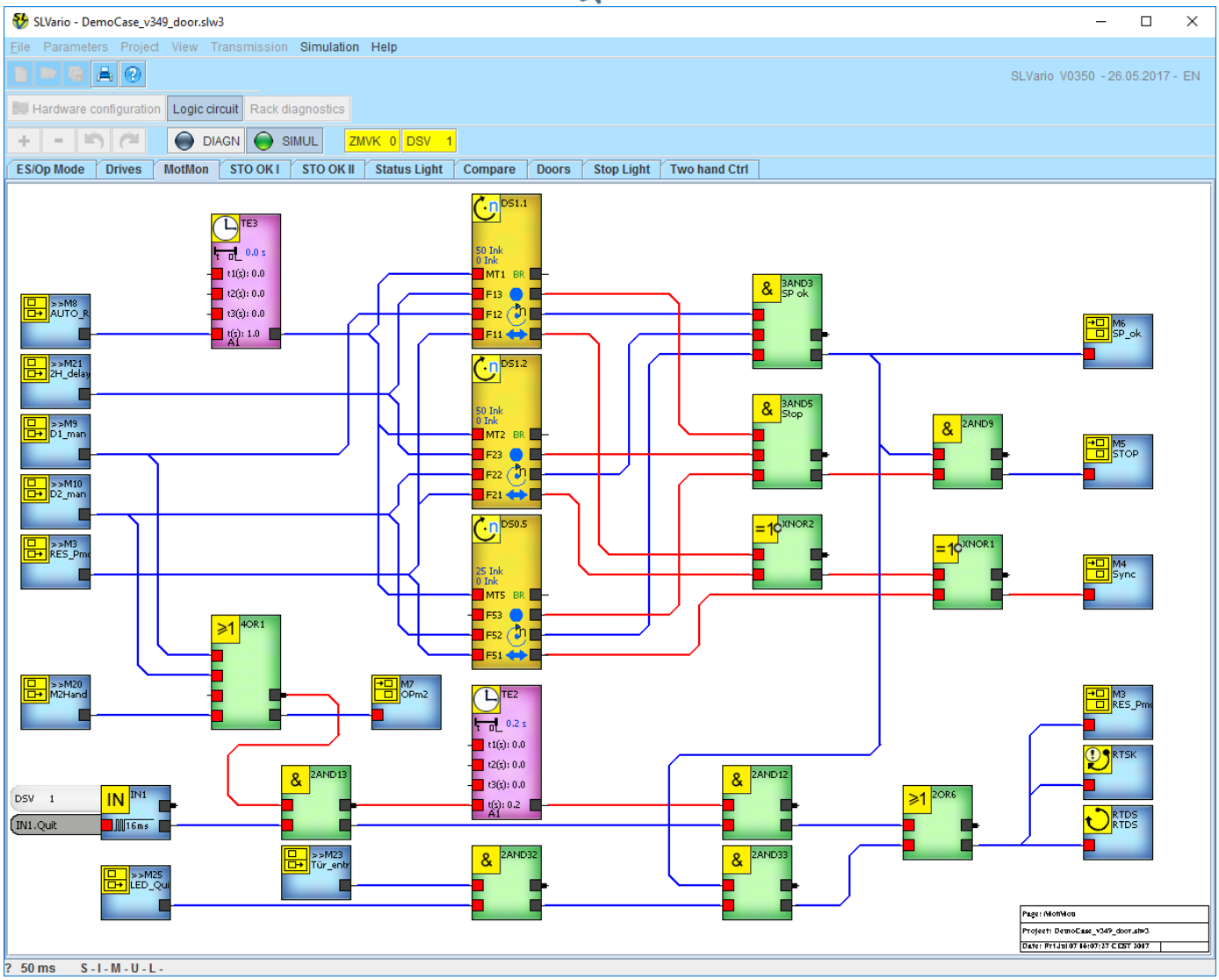
Wolfschlugen, 22. Oktober 2018

Dirar Najib

SLVARIO

The direct way to safe automation





Contents

1 SL VARO Modules

Central modules	Speed monitoring	In-, output modules	Network module	Field busses	Cascade module
DNSL-ZMV DNSL-ZMVA DNSL-ZMVD DNSL-ZMVK	DNSL-DSV DNSL-DSV2 DNSL-DSIV DNSL-DRV DNSL-SIV	DNSL-INV DNSL-IOV DNSL-RMV	DNSL-NIV DNSL-NRV	DNSL-COV DNSL-DPV DNSL-ECV DNSL-EPV DNSL-MOV DNSL-PLV DNSL-PNV	DNSL-CMV

2 Intended purpose

Testing based on:

- EN 55011: 2009+A1 2010 (class A), DIN EN 61326-1: 2013-07, EN 61000-6-2: 2016-05, EN 61326-3-1: 2015-06, EN 61000-4-11: 2005-02
- DIN EN 60947-5-1: 2015-05
  Low-voltage switch gear, part 5.1: Control circuit devises and switching elements-electromechanical control circuit devices
- DIN EN ISO 13849-1: 2016-06
  Safety-related parts of control systems; Part 1: General principles for design category 4, PLe
  Using table 3 of DIN EN 13849-1: 2016-06 this is conform to SIL 3
- DIN EN ISO 13849-2: 2013-02
  Safety-related parts of control systems; Part 2: Validation
- DIN EN 574, type IIIC: two-hand control devices
- DIN EN ISO 13856-1:2013-08 / -2:2013-08 / -3:2013-12, for signal processing only
- GS-ET-20: 2016-10:
  basic principles for testing and certification of safety switch devices

Authorized person for the combination of the technical documents: Dirar Najib, CEO
Esslinger Str. 84, D 72649 Wolfschlugen,
Wolfschlugen, 2017-07-27

2.1 Certification data

Modul	MTTFd	PL	DC	SFF	PFHd
DNSL-ZMV	79 years	E	high	99%	3.0×10^{-8}
DNSL-ZMVK	141 years	E	high	99%	1.6×10^{-8}
DNSL-DSV	97 J years	E	high	96%	2.5×10^{-8}
DNSL-DRV	97 years	E	high	96%	2.5×10^{-8}
DNSL-SIV	165 years	D	high	95%	3.3×10^{-8}
DNSL-INV	238 years	E	high	95%	1.4×10^{-8}
DNSL-IOV	97 years	E	high	96%	2.5×10^{-8}
DNSL-RMV	91 years	E	high	98%	2.5×10^{-8}
DNSL-CMV	91 years	E	high	98%	2.5×10^{-8}
DNSL-NIV	214 years	D	high	95%	1.1×10^{-8}
DNSL-DPV	305 years	E	high	95%	8.0×10^{-9}
DNSL-ECV	305 years	E	high	95%	8.0×10^{-9}
DNSL-COV	305 years	E	high	95%	8.0×10^{-9}

DGUV Test
ET 17079
Sicherheit geprüft
tested safety

T_M:20 years

c UL US LISTED
IND.CONT.EQ
1ZD7
E227037

CE

Product is evaluated as safety device according to: DIN EN ISO 13849-1: 2008-12, category 4, Ple

- Certificated by: (Fachausschuss für Elektrotechnik, Prüf- und Zertifizierungsstelle Köln), European notified institution, Identification-number 0340 EC-Type Test certificate (DGUV Test: ET 17078 from 2017-09-01)
- EMC-directive certificated by "ELMAC GmbH Bondorf", Reg. No.: DAT-P-206/05-00
- CNL, USL: File E227037
- QM System certificated according to DIN EN ISO 9001:2015 by "DQS, Frankfurt", Reg.-No.: 067542 QM 08
- Certificate and declaration of conformity: See www.dina.de, download

3 Safety regulation

- The device may only be installed and commissioned by an electrician or trained persons who are familiar with these operating instructions and the applicable regulations regarding work safety and accident prevention.
- Observe the VDE, EN and local regulations, particularly with respect to the protective measures.
- Failure to observe the regulations may result in death, severe bodily injury or extensive property damage.
- For emergency-stop applications, either the integrated function for restart interlock must be used or automatic restarting of the machine must be prevented by means of a higher-level control.
- During transport, storage and operation adhere to the conditions specified in EN 60068-2-1, 2-2!
- Unauthorized modifications shall render any warranty null and void. Dangers may thereby arise that could result in severe injuries or even death.
- Install the device in a control cabinet with a protection class of at least IP54! Dust and moisture may otherwise result in impaired functions.
  Installation in a control cabinet is mandatory.
- Ensure adequate protection circuits at output contacts for capacitive and inductive loads!
- The device is to be installed taking into account the distances required per DIN EN 50274, VDE 0660-514.
- During operation, switching devices carry dangerous voltage. Do not remove protective covers.
- Replace the device after the first malfunction!
- Properly dispose of the device at the end of its service life. 
- If these regulations are not adhered to or in the event of improper use, DINA Elektronik GmbH accepts absolutely no liability for the resulting property damages or personal injury.
- Save this product information!

3.1 Important notes and validation

- The product described here was developed to perform safety-related functions as part of a complete system.
- The complete system consists of sensors, evaluation and message units as well as concepts for safe shutdowns.
- It is the responsibility of the manufacturer of a system or machine to ensure the proper overall function.
- The manufacturer of the system is required to test and to document the effectiveness of the implemented safety concept within the complete system.
- This verification is to be performed after every modification to the safety concept or to safety parameters.
- DINA Elektronik is not in the position to guarantee the properties of a complete system that was not designed by DINA.
- DINA Elektronik GmbH also accepts no liability for recommendations that are given or implied by the following description.
- No new guarantee, warranty or liability claims that extend beyond DINA's general delivery conditions can be derived on the basis of the following description.
- To avoid EMC disturbances, the physical environmental and operating conditions at the installation location of the product must comply with section EMC of DIN EN 60204-1.
- The safety function must be required every month if there is performance level (e) and every year if there is performance level PLd is required by using contact outputs.
- The information in the general technical data at the end of the operating instructions must be adhered to.

4 Product description

- SL VARIO is a multi-functional, modular and configurable safety system.
- The system consists of a central module and different function- and field bus modules.
- The field bus enables a communication between SL VARIO and the field bus master.
- The product is appropriated to be used in machines and automation to avoid dangers.
- The central module is available in 45 or 67.5 mm housing depending on the quantity of outputs.
  All other modules are in 22.5 mm housing.
- Mounting happens on a 35 mm standard rail.
- The modules are connected directly to the ground via the standard rail.
- The modules are plugged together via a bus connector at the rail side. The bus is on 2 channels.
- Up to 15 modules can be used in one application.
- Modules with different functions are available.
- A variety of functions are available such as speed monitoring, logic modules, timers, safety circuits, mode selector, generator, counters, comparators, feedback, restart interlock functions.
- A lot of safe digital and analogue inputs, safe semiconductor and contact outputs are available.
- The status of inputs, outputs, power supply and diagnostic functions is displayed via LED.
- Online and rack diagnostic are available via the Designer.
- An application can be simulated without hardware.
- Overvoltage and overcurrent are monitored.
  Voltage ≥30V or not connected terminal (A2) disconnects internally the terminals (A1) and (P).
- Semiconductor outputs are overload and short-circuit-proof.
- An internal temperature sensor for diagnostic function via the Designer is available in all modules.
- The user´s application will be developed through the Designer. The data transfer happens via the USB interface at the central module.
- The Designer is software developed by DINA.
- A memory chip is installed inside the central module. Documents as application software, Designer and instruction manuals can be transferred to the memory using the USB interface.
- The memory chip can be used as a drive.

Remark

The function devices are tested safe and certificated as a part of the firmware.

A modification of the certified function devices as part of the firmware is excluded.

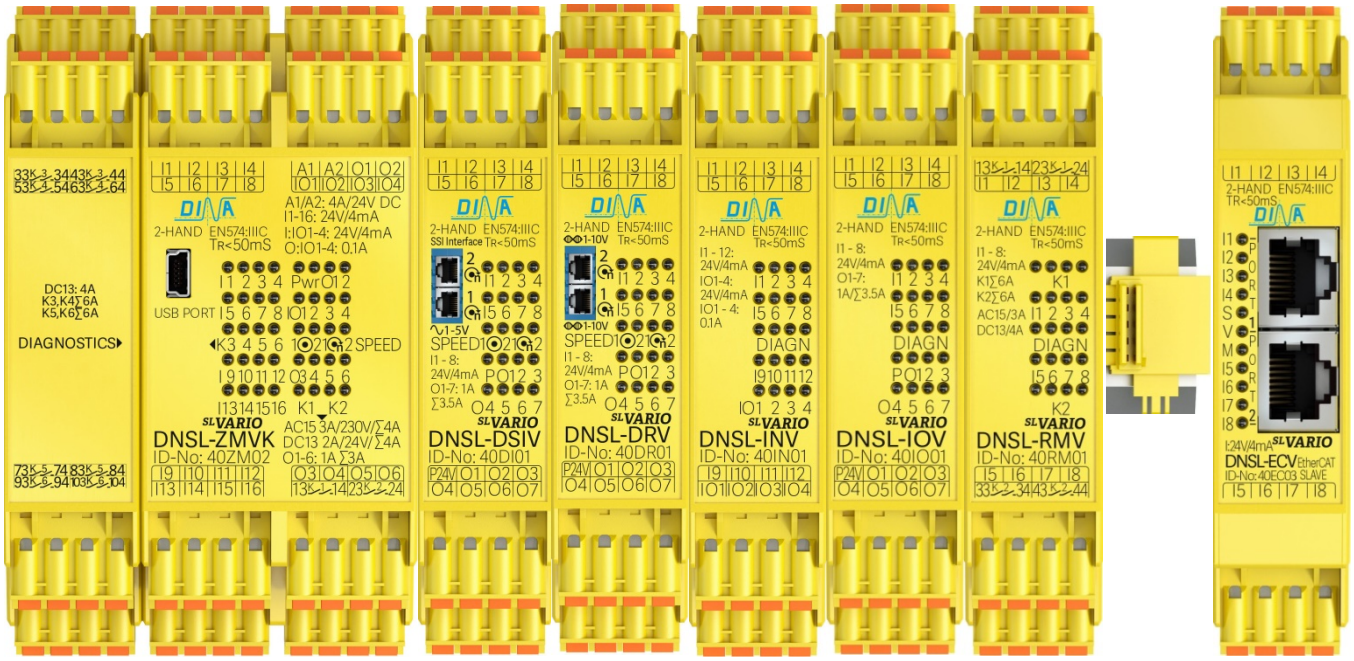
4.1 Usage example:

Metal machining
Wood machining
Filling machines
Packing machines
Moving stairs
Lifts
Theatre stage technic
Driverless transport systems and much more

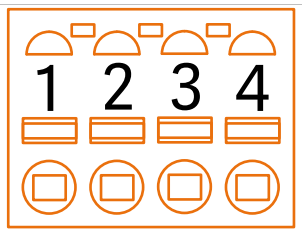
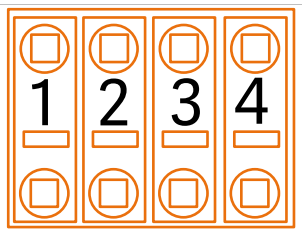
4.2 Mounting

- The central module is placed on the left side. All other modules must be added to the right side.
- For an application a central module is necessary.
- The number of the functional modules depends on the requirements.
- The plugs for measurement systems at the speed monitoring and for the data interface at the network and cascade module are on the top side of the module after mounting.
- RJ45 plugs are also at the bottom side of DNSL-ZMD and DNSL-NRV for speed monitoring and network. They are to use for description function only.
- The connecting cable can be fed directly into the cable channel.
- The field bus connector is at the front side.

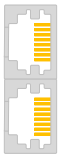
Central module	Speed monitoring		In-, output modules				EtherCAT
DNSL-ZMVK	DNSL-DSIV	DNSL-DRV	DNSL-INV	DNSL-IOV	DNSL-RMV	Bus	DNSL-ECV



4.3 Terminal

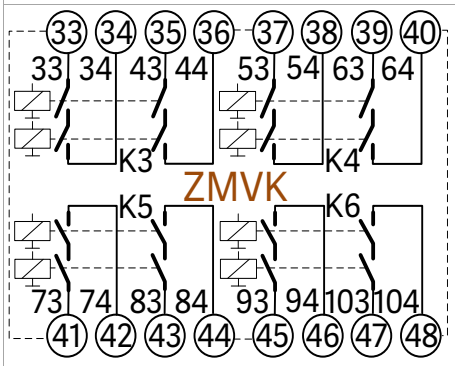
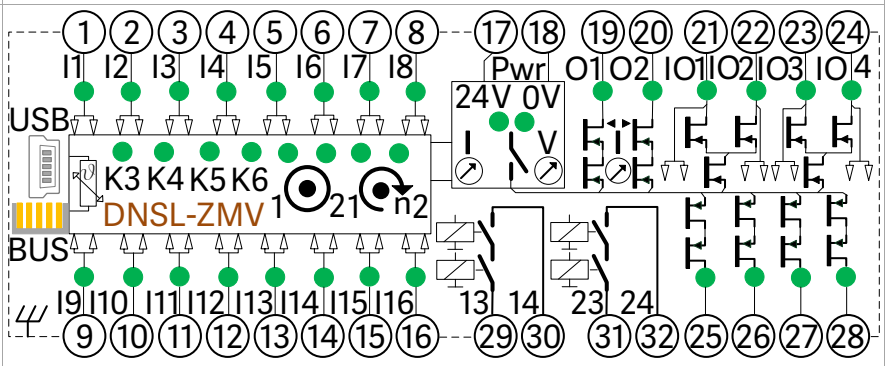
Single terminal	Twin terminal
	
In standard the modules are equipped with single terminals. Unlocking happen above the terminals	All modules are deliverable with twin terminals. Unlocking: above or between the terminals

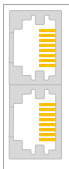
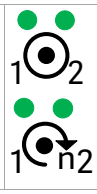
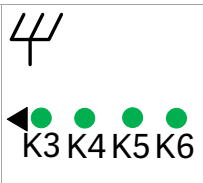
5 Central modules

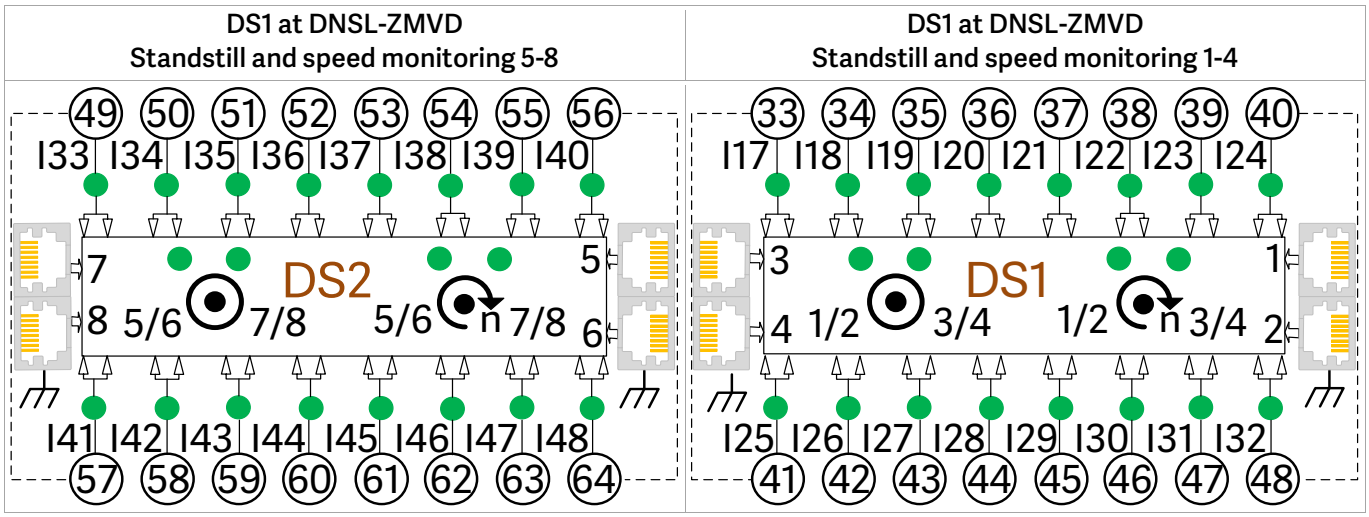
	Terminal					
	Single	Twin	Single	Twin		
DNSL-	ID-No.:	ID-No.:	ID-No.:	ID-No.:	Connector	Description
ZMV	40ZM01 40ZM31*	40ZM21 40ZM32*	42ZM01 42ZM06*	42ZM51 42ZM56*	I1-I8	Safe analogue-digital inputs for safety functions
ZMVK	40ZM02 40ZM04	40ZM22 40ZM24	42ZM02 42ZM04	42ZM52 42ZM54		
ZMVA	46ZM01	46ZM51				
ZMVD	44ZM01	44ZM51	48ZM01	48ZM51		
ZMV	40ZM05	40ZM25	42ZM05	42ZM55	I1-I8	Safe analogue inputs only
all					I9-I16	Safe digital inputs for safety functions
all					1: I9/I10 2: I11/I12	2 safe monitoring of standstill and speed via sensor with 24V signals
ZMV	40ZM03	40ZM23	42ZM03	42ZM53	1: I9-I12 2: I13-I16	2 safe monitoring of standstill, speed, position, direction and brake HTL measuring system
ZMVK	40ZM04	40ZM24	42ZM04	42ZM54		
ZMVD	44ZM01	44ZM51	48ZM01	48ZM51	I17-I32	Safe digital inputs
ZMVD	48ZM01	48ZM51			I33-I48	Safe digital inputs
ZMVD	44ZM01 48ZM01	44ZM51 48ZM51				4 safe speed monitoring (44ZM51) 8 safe speed monitoring (48ZM51) of standstill, speed, position, direction and brake, sin/cos or TTL measuring system
all					IO1-IO4	Safe digital inputs or Safe semi-conductor outputs
all					O1-O6	Safe semi-conductor outputs
all					K1-K2	Safe contact outputs
ZMVK	40ZM02 40ZM04	40ZM22 40ZM24	42ZM02 42ZM04	42ZM52 42ZM54	K3-K6	Safe contact outputs each 2 contacts
all						USB interface for data transfer with data memory*
all					A1/ A2	Betriebsspannung 24V DC für das Zentralmodul und alle weiteren Module in der Applikation.

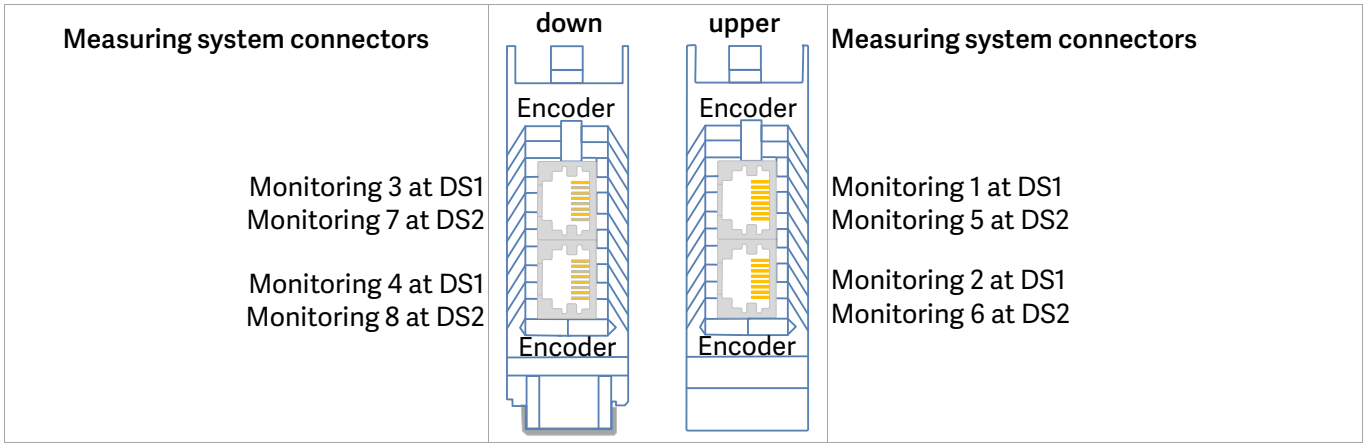
*)40ZM31, 40ZM32, 42ZM06 and 42ZM56: No contact outputs K1, K2 and no data memory

5.1 Connection schematic

Contact extension at ZMVK	DNSL-ZMV
	

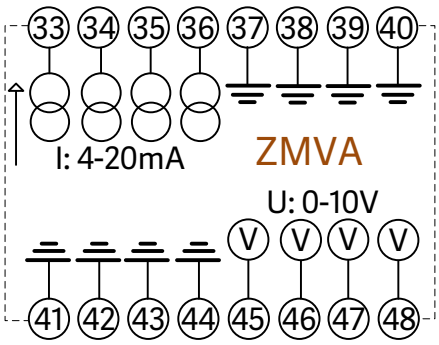
	RJ45 female for measuring system connection via DINA cable adapter Typ DNDA xx		Standstill display Speed display		Connector to earth via DIN rail Switching status display for K3-K6





5.2 Central module DNSL-ZMVA

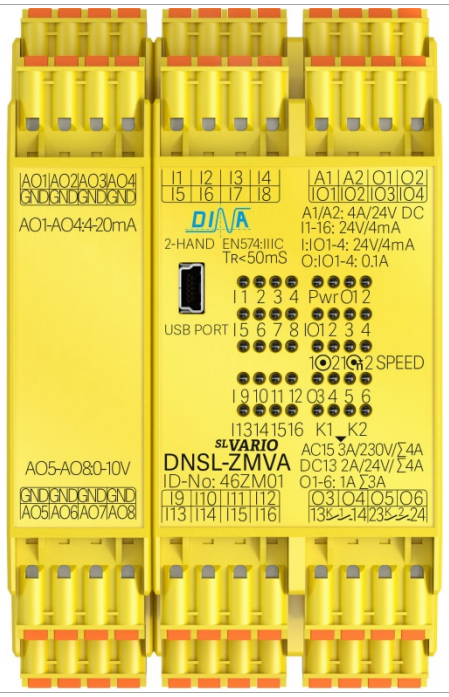
Analogue part of DNSL-ZMVA
Basis part: see DNSL-ZMV



Description of the analogue part:

The outputs AO1 to AO4: 4-20mA.
The outputs AO5 to AO8: 0 bis 10V
Current and voltage outputs are proportional to gather.

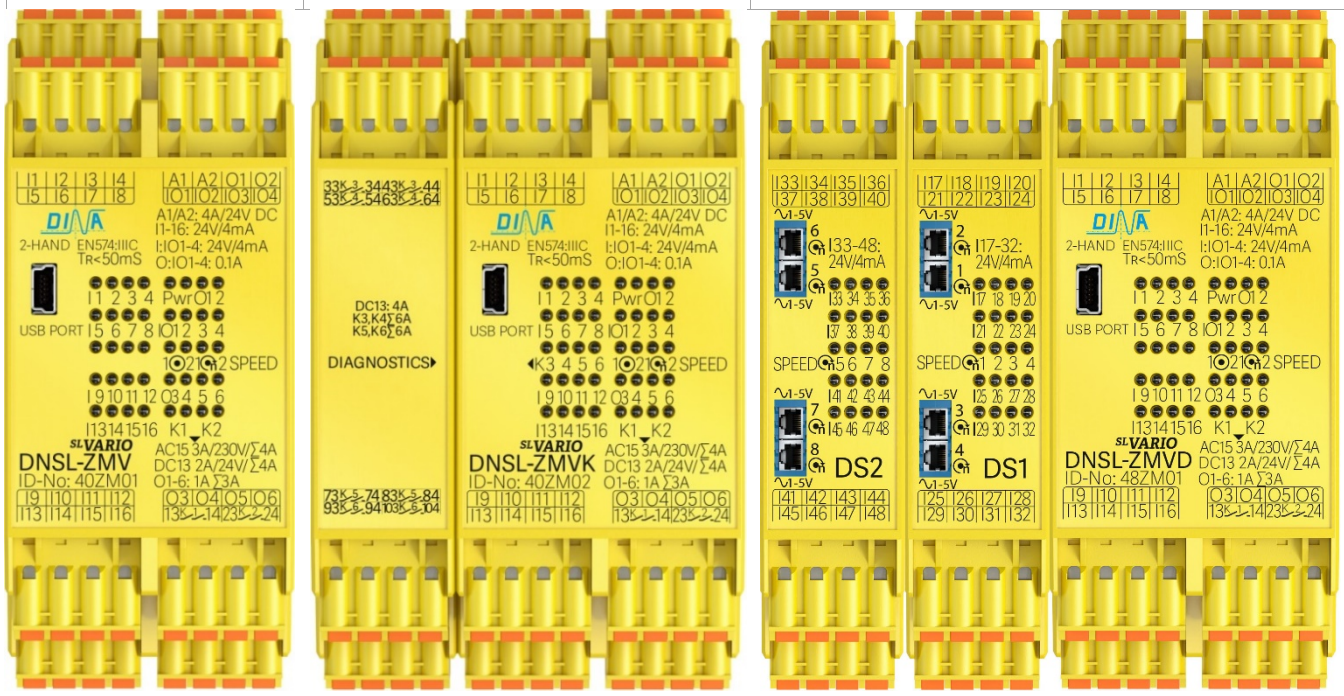
AO1 (4 to2 0mA) to AO5 (0...10V)
AO2 (4 to 20mA) to AO6 (0...10V)
AO3 (4 to 20mA) to AO7 (0...10V)
AO4 (4 to 20mA) to AO8 (0...10V



- The source to control the analogue outputs can be configured using the parameter mask at the Designer.
- Sources are analogue terminals, standardized values (weight power), adders, subtractors etc.
- A minimum and a maximum has to be entered in the Designer mask.
- For more details, see the instruction manual Designer.

5.3 Front side

DNSL-ZMV	DNSL-ZMVK	DNSL-ZMVD



5.4 Switching status display

In- Outputs				Pwr: 1 2	
I1 — I48	Signal = 0V	Signal = 24V		Pwr 1 : Data transfer	
IO1 – IO4	Signal = 0V	Signal = 24V		Pwr 1 : Error	
O1 – O6	I = 0	I > 0 ≤ max.		Pwr 1 : OK not Valid	
IO1 – IO4	I = 0	I > 0 ≤ max.		Pwr 1 : Valid	
K1 / K2				Pwr 2 : Synchronisation	
K3 –K6				Pwr 2 : Error	
				Pwr 2 : OK	

Standstill and speed monitoring at ZMV, ZMVK and ZMVD

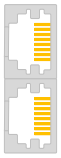
1 2	n = 0	1 2	n > 0	1 n2	n < max.	1 n2	n > max.	1 n2	No encoder

DNSL-ZMVD/ DS1 (LED 1 – 4)/ DS2 (LED 5 – 8)

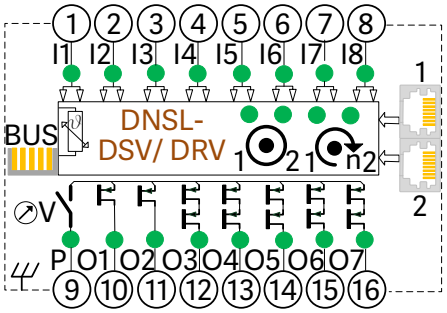
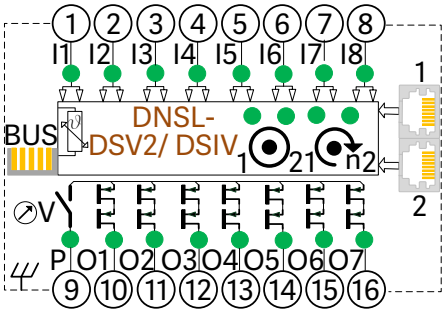
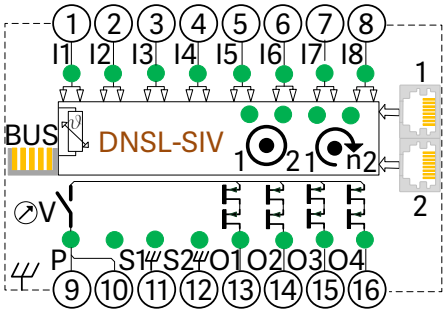
LED 1: n 1	LED 2: n 2	LED 3: n 3	LED 4: n 4	LED 5: n 5	LED 6: n 6	LED 7: n 7	LED 8: n 8

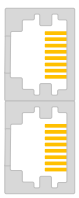
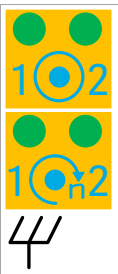
Switching status display of the standstill and speed monitoring at DNSL-ZMVD/ DS1 and DS2

LED 1 - 8: monitoring 1 - 8	Standstill output	Speed output	Standstill output
n = 0			Configurable using Designer
n > 0 < max.	s		
n > max.			
n > max.			n = 0
no encoder			
n = Speed	n: monitoring		

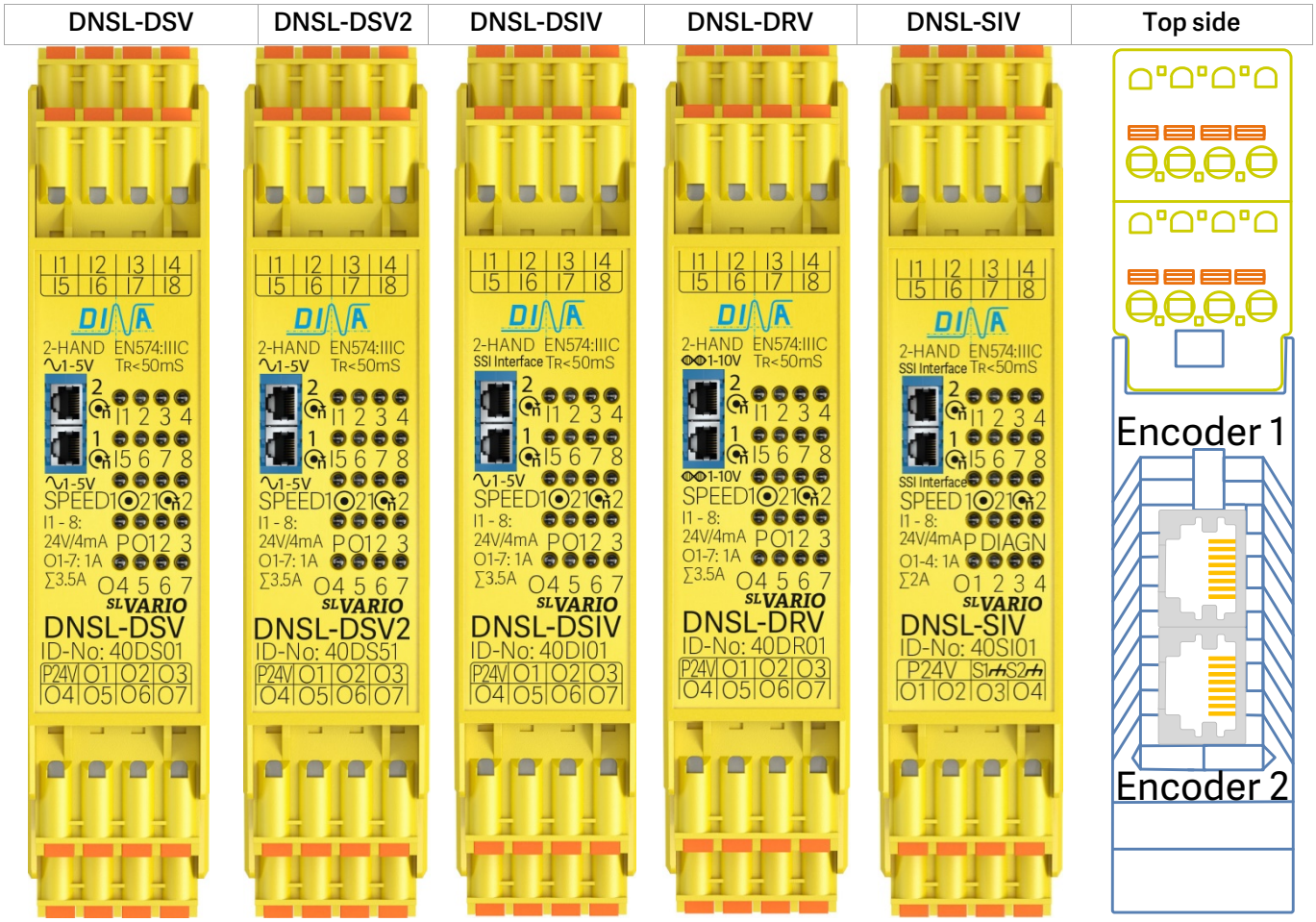
	Terminal			
	Single	Twin		
DNSL-	ID-No.:	ID-No.:	Connector	Description
DSV DSIV DRV SIV	40DS01 40DI01 40DR01 40SI01	40DS21 40DI21 40DR21 40SI21	I1-I8	Safe digital inputs for safety functions
	alle	alle		2 Safe monitoring of standstill, speed, position, direction and brake in different operating modes
DSV	40DS01	40DS21		Sin/Cos, TTL, HTL Measuring system,
DSV	40DS02	40DS22		HTL A and B track only
DRV	40DR01	40DR21		Resolver Measuring system
SIV	40SI01	40SI21		SSI Interface
DSIV	40DI01	40DI21		Sin/Cos, SSI interface with comparator function
DSV DRV	alle	alle	O1, O2	Semi-conductor outputs also clock outputs
DSV DRV	alle	alle	O3-O7	Safe semi-conductor outputs
DSV DSIV	40DS51 40DI01	40DS71 40DI21	O1-O7	Safe semi-conductor outputs
SIV	40SI01	40SI21	O1-O4	Safe semi-conductor outputs
	alle	alle	P	24V DC to supply the semi-conductor outputs Monitored voltage

5.5 Connection schematic

DNSL-DSV/ DRV	DNSL-DSIV and DSV/ 40DS51	DNSL-SIV
		

	RJ45 Female for Measuring system connection using DINA cable adapter type DNDA xx		Standstill display for monitoring 1 and 2 Speed display for monitoring 1 and 2 Connector to earth via DIN rail

5.6 Front side



5.7 Switching status display

I1 – I8	Signal = 0V	Signal = 24V
P	Pwr = 0V	Pwr = 24V

1 ○ 2	1 ○ 2	n = 0 at 1 + 2
1 n 2	1 n 2	n < max. at 1 + 2
1		n > 0 at 1+2
n		n>max. at 1+2
1 n		
n 2		

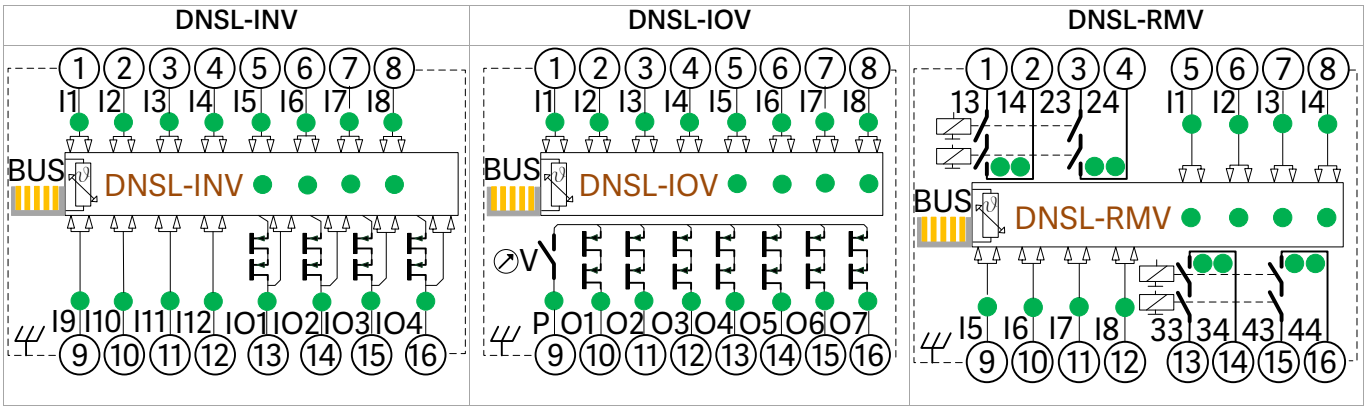
O1 – O7	I = 0	I > 0 ≤ max.
O1 – O4	I = 0	I > 0 ≤ max.

n = Speed	DSV / DRV	O1, O2	O3 – O7

6 In-, output modules

	Terminal			
	Single	Twin		
DNSL-	**ID-No.:**	**ID-No.:**	**Connector**	**Description**
INV **IOV** **RMV**	40IN01 40IO01 40RM01	40IN21 40IO21 40RM21	I1-I12 I1-I8 I1-I8	Safe digital inputs for safety functions
INV			IO1-IO4	Safe digital inputs Safe semi-conductor outputs
IOV			O1-O7	Safe semi-conductor outputs
RMV			K1, K2	Contact outputs each 2 safe NO
IOV			P	24V DC for the outputs Monitored voltage

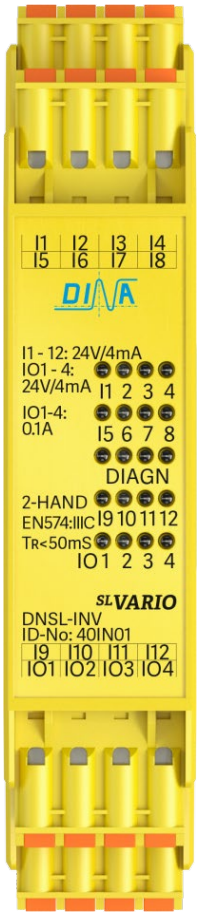
6.1 Connection schematic



● ● ● ●	LED Display for diagnostics	⏚	Connector to earth via DIN rail

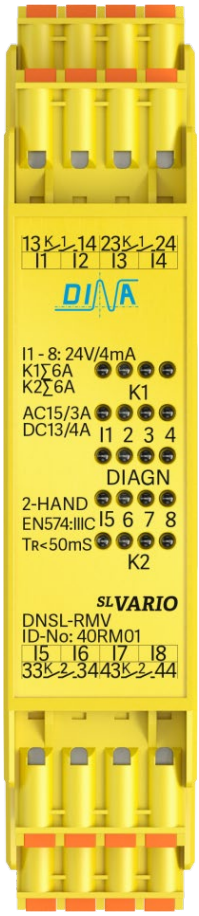
6.2 Front side

DNSL-INV



DNSL-IOV

DNSL-RMV



6.3 Switching status display

DNSL-INV

I1– I12	Signal = 0 V	Signal = 24 V
IO1-IO4	Signal = 0 V	Signal = 24 V
IO1-IO4	I = 0	I > 0 ≤ max.
DIAGN	links: CAN Kommunikation OK links: Keine CAN Kommunikation	2–4 rechts: Modulfunktion OK 2 – 4 rechts: Interner Fehler

DNSL-IOV

I1 – I8	Signal = 0 V	Signal = 24 V
O1 – O7	I = 0	I > 0 ≤ max.
DIAGN		Immer grün

DNSL-RMV

I1 – I8	Signal = 0 V	Signal = 24V
K1/ K2		
DIAGN		Immer grün

7 Field bus modules

	Terminal				
	Single	Twin			
DNSL-	ID-No.:	ID-No.:	Function	Terminal	Description
COV	40CO03	40CO23	CANopen	I1-I8	8 Safe digital inputs for safety functions at the field bus modules left 4 Byte input data at the field bus modules left 8 Byte output data at the field bus modules left Number of Byte is configurable
DPV	40DP03 40DP04	40DP23 40DP24	Profibus DP		
ECV	40EC03	40EC23	EtherCAT		
EPV	40EP03	40EP23	Ethernet /IP		
MOV	40MO03	40MO23	Modbus		
PLV	40PL03	40PL23	Power link		
PNV	40PN03	40PN23	ProfiNET		

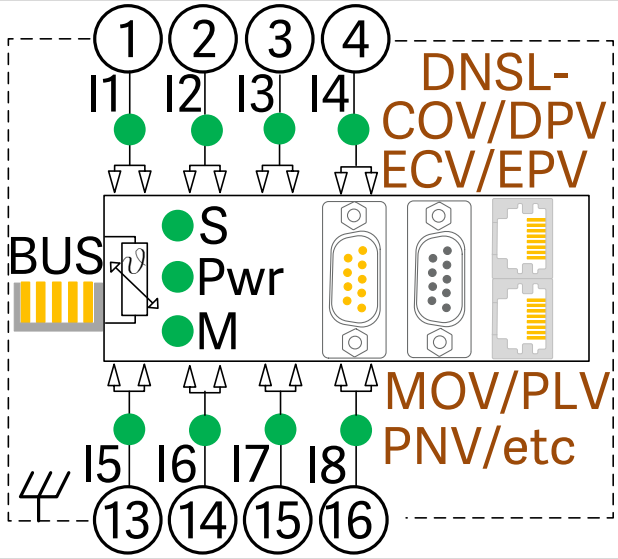
Feld bus modules with 10 terminal inputs

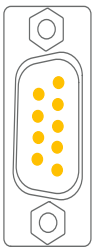
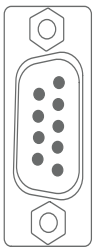
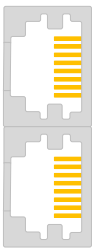
DPV	40DP05		Profibus DP	I1-I10	10 Safe digital inputs for safety functions at the field bus modules left 4 Byte input data at the field bus modules left 16 Byte output data at the field bus modules left
ECV	40EC05		EtherCAT		
MOV	40MO05		Modbus		

7.1 Usage

- The digital inputs can be used for safety functions. See inputs for safety functions
- The field bus modules are for data transfer between SL-VARIO application and machine control via the field bus master.
- The data can be for diagnostics respectively for not safety relevant control signals
- Data transfer from or to the machine control are possible.

7.2 Connection schematic

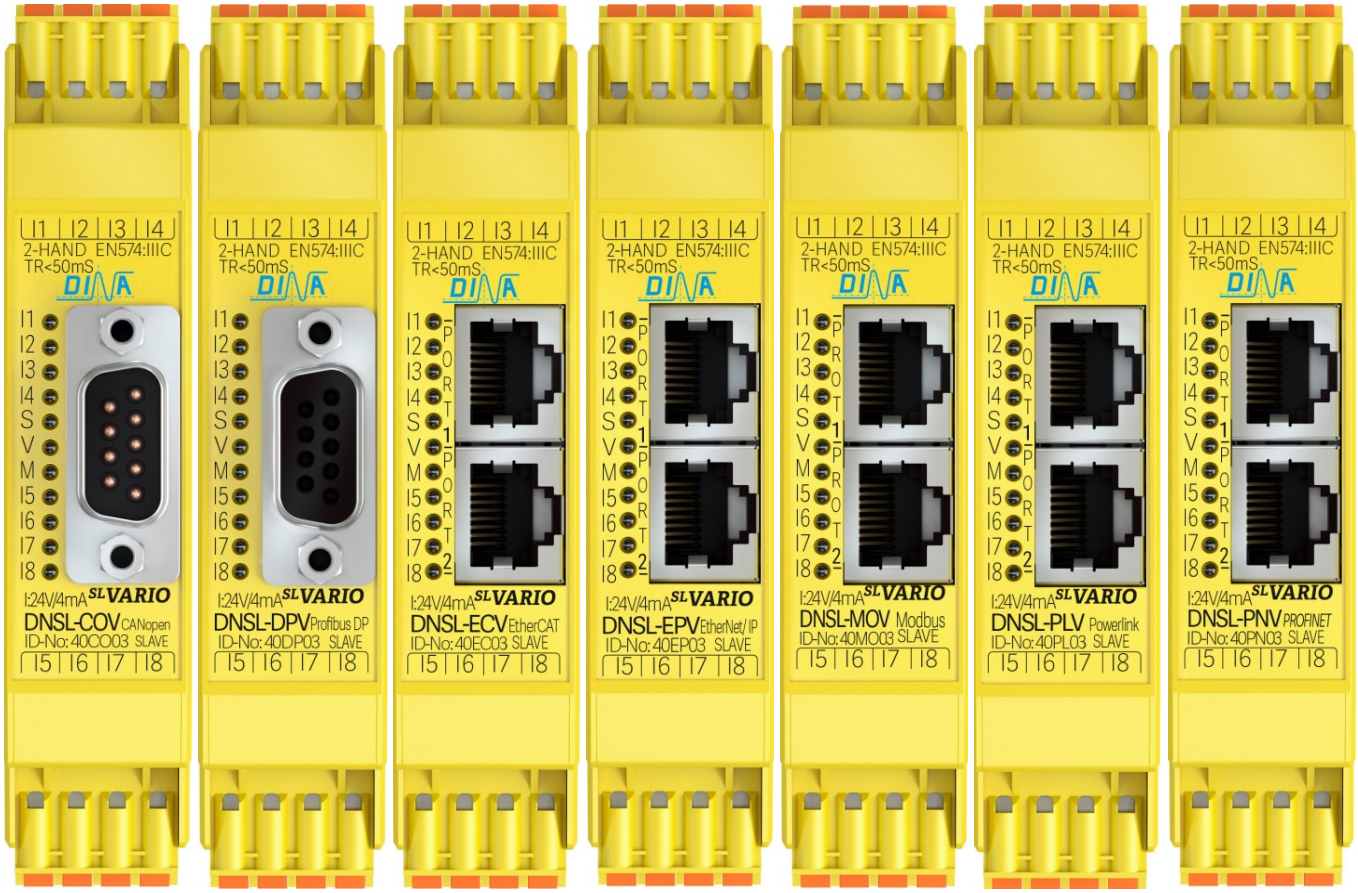


Bus connection for CANopen	us connection for Profibus DP	Bus connection for all others
		

⏚	Connector to earth via DIN rail

7.3 Front side

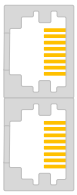
DNSL-COV	DNSL-DPV	DNSL-ECV	DNSL-EPV	DNSL-MOV	DNSL-PLV	DNSL-PNV



7.4 Switching status display

	I1 – I8		Signal = 0V		Signal = 24V
	I1 – I10		Signal = 0V		Signal = 24V
	V		Pwr = 0 V		Pwr = 24 V
	M/ S		Error		OK

8 Cascade module DNSL-CMV

	Terminal			
	Single	Twin		
DNSL-CMV	**ID-No.:**	**ID-No.:**	**Anschluss**	**Description**
	40CM03	40CM23	AD1- AD4	Addressing inputs
			B	Input to adapt the bus system. In the periphery unit it must be connected to 24V DC.
				Communication interface between the base unit with the periphery unit
			A1, A2	Power supply 24V DC
			S1, S2	Interface grounding, module grounding via the rail

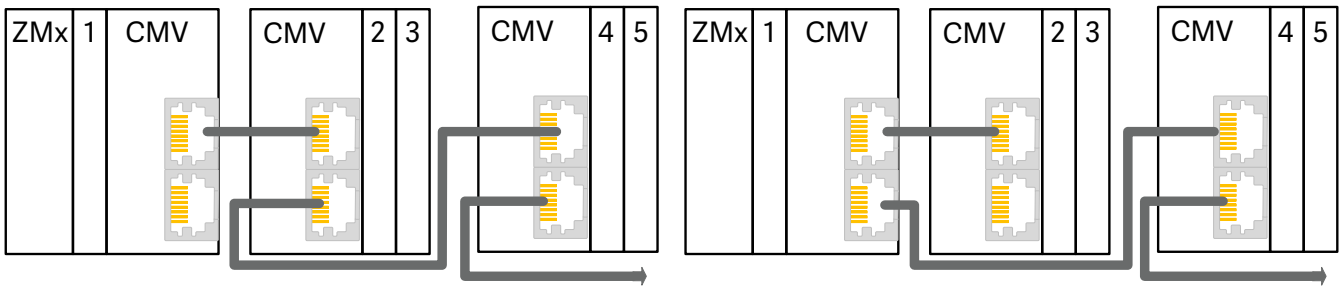
8.1 Usage

- Mounting of the modules of an application on different places to avoid costly wiring
- A cascade contains a base unit BU with central module and up to 5 periphery units PU
- In every unit is one DNSL-CMV.
- In the PU DNSL-CMV replaces the central module.
- Serial or starry cascade is possible.
- The units are via patch cables connected together.
- The maximal length of all patch cables is 100 m.
- The power supply 24V DC happens via A1/ A2 at CMV if there is patch cable length > 10 m.
- The addressing of the first FM in the PU happens via AD1–AD4 at CMV.
- The addressing of the follow modules in the PE happens automatically.
- 15 modules are possible in one application.
- The binary code enables 1 to 14 addresses.
- 0 and 15 are not allowed.
- B-input must be connected to 24V DC at periphery units.

Base units with the central module, necessary function modules and the cascade module DNSL-CMV	Periphery unit with DNSL-CMV and necessary function modules	Periphery unit with DNSL-CMV and necessary function modules

8.2 Serial and star shape cascade

Serial shape cascade	Star shape cascade



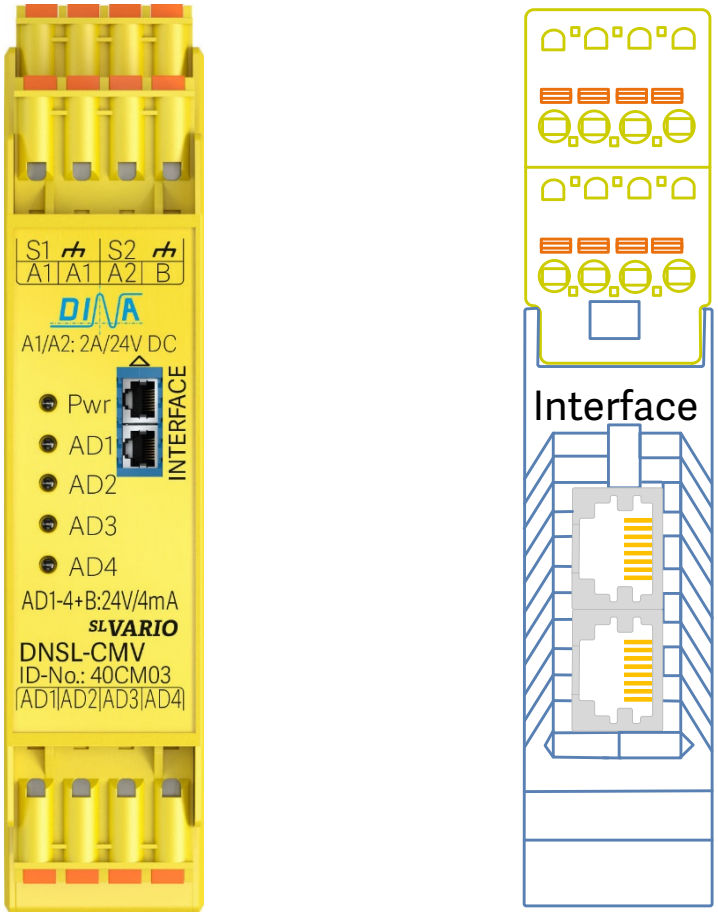
8.3 Addressing of the function modules

- The addressing of the first FM in the PU happens via AD1 – AD4 at CMV.
- The address of the follow modules in the PU happens automatically.

AD	BE/BU	CMV	PE1/PU1	PE2/PU2	PE3/PU3	AD1	AD2	AD3	AD4
0	ZMV								
1	FM1								
2	FM2								
3	FM3								
	CMV0								
4		CMV1	FM4						
5	auto		FM5						
6	auto		FM6						
7		CMV2		FM7					
8	auto			FM8					
9		CMV3			FM9				
10	auto				FM10				
11	auto				FM11				

By cascade modules we recommend the usage of patch cable with plugs from the company Hirose with the ID-no.: TM11AP-88P (61) to ensure the quality.

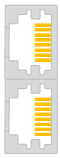
8.4 Front and side view



8.5 Switching status display

Pwr	Pwr = 0 V	Pwr = 24 V
AD1 – AD8	Signal = 0V	Signal = 24V

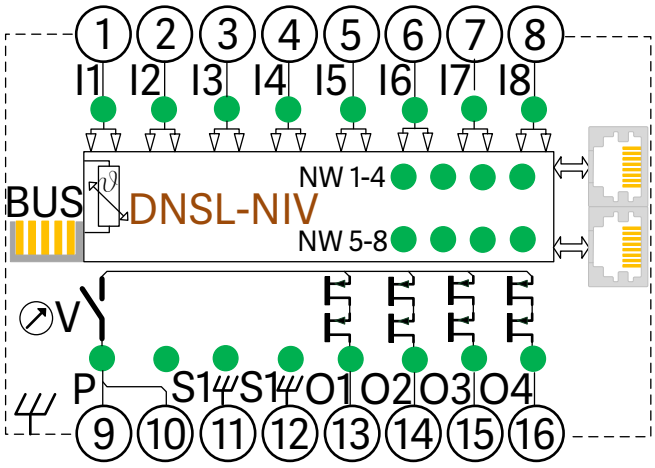
9 Network module DNSL-NIV

	Terminal			
	Single	Twin		
DNSL-NIV	**ID-No.:**	**ID-No.:**	**Connector**	**Description**
	40NI01 40NI02	40NI21 40NI22	I1-I8	Safe digital inputs for safety functions
				Communication interface
			O1-O4	Safe semi-conductor outputs
			P	24V DC for the outputs, monitored voltage
			S1, S2	Interface grounding

9.1 Usage of DNSL-NIV

- Data transfer between up to 8 applications
- For every system is one DNSL-NIV required.
- Via patch cable the applications will be contacted serial. The cable length can be max. 100 m.
- After a break of the data transfer a quit is required.
- Therefor a quit symbol in the Designer is provided.
- For data transfer 32 in- and 32 outputs.
- The configuration happens in the Designer.
- RJ45 connectors are to use for specified function only

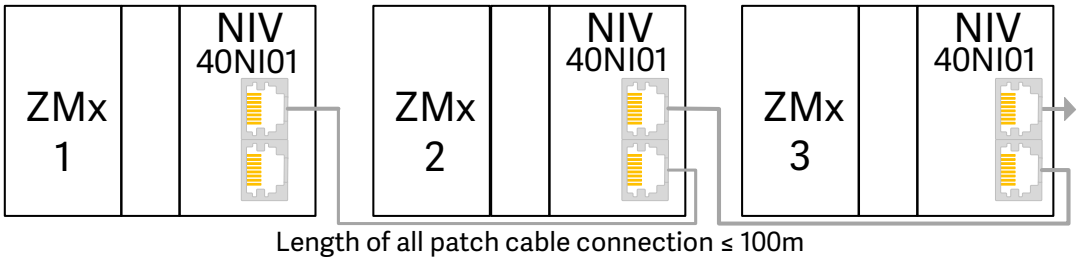
9.2 Connection schematic



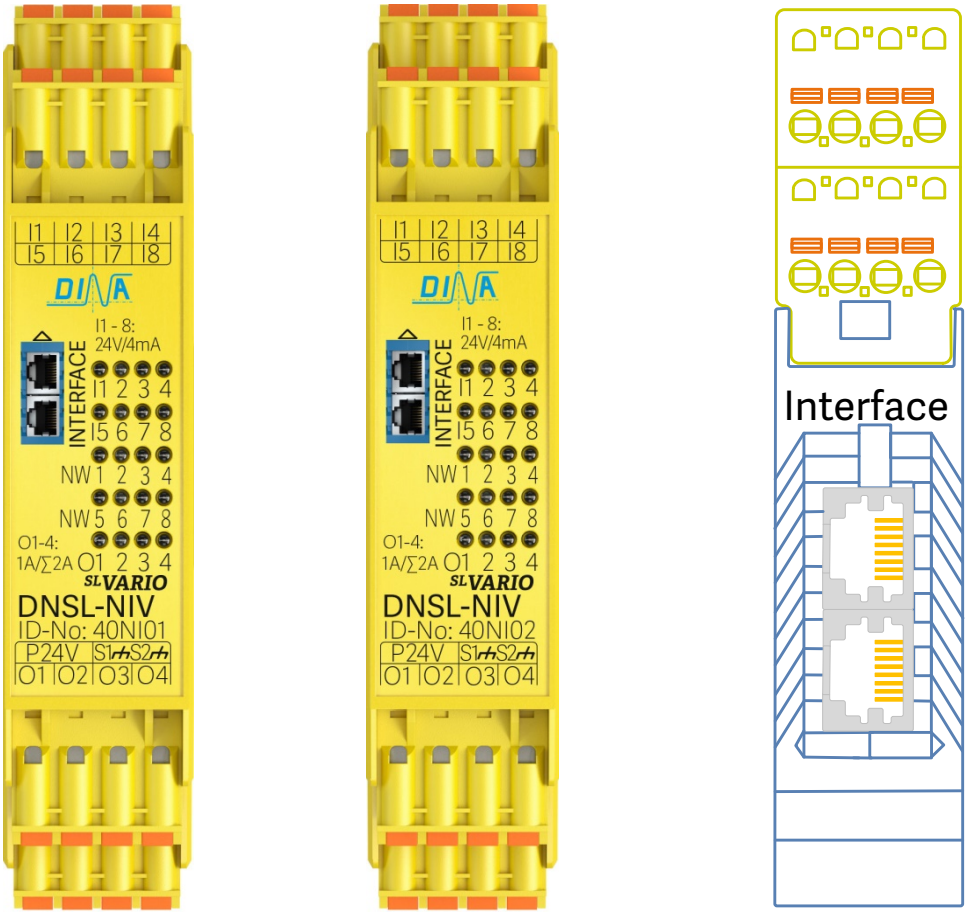
	Connector to earth via DIN rail

9.3 Networking of SL VARIO applications

networking up to 8 applications is possible.



9.4 Front and side view

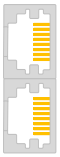


9.5 Switching status display

I1 – I8	Signal = 0V	Signal = 24V	
O1 – O4	I = 0	I > 0 ≤ max.	
NW 1 2 3 4	Network Address 1-4 for application 1-4	Local participant	Example 2: External participant 3 Receiving of data will be ignored Sanded data of 3 will be interpreted
NW 5 6 7 8	Network Address 5-8 for application 5-8	Example 1: External participant 6 6 Participant 6 with data transfer	Example 3: External participant 8 Participant 8 is not available

The addressing of the Participants happens at the Designer. Address 1 to 8 is possible.

10 Network module DNSL-NRV

	Terminal				
	Single	Twin			
DNSL-NRV	ID-No.:	ID-No.:	Connector	Connector	Description
	40NR01	40NR21			Communication interface
			MH, ML, SH, SL		Communication interface
			A1, A2		Power supply 24V DC

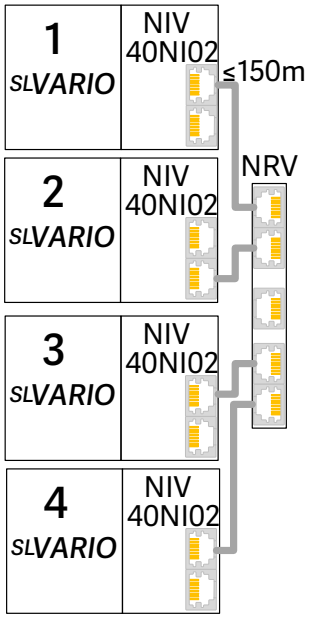
10.1 Usage of DNSL-NRV

- Networking up to 8 applications is possible.
- The cable length between the applications can be up to 150 m.
- The RJ45 plugs placed at the side of NRV are only to connect with the RJ45 plugs at NIV (40NI02).
- The RJ45 plug at the front side of NRV is to connect with the RJ45 plug at NIV (40NI01).
- The connection of the four network plugs at the side of NRV is displayed via LED, at the front side is not displayed.
- The connection from NRV to NIV (40NI02) can be happen at RJ45 plug 1 or 2.

10.2 Connection schematic

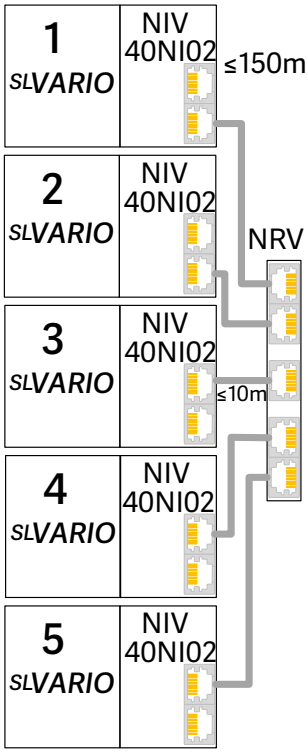
Schematic 1
Using of DNSL-NIV(40NI02) and NRV (40NR01)

Networking up to 4 applications is possible.



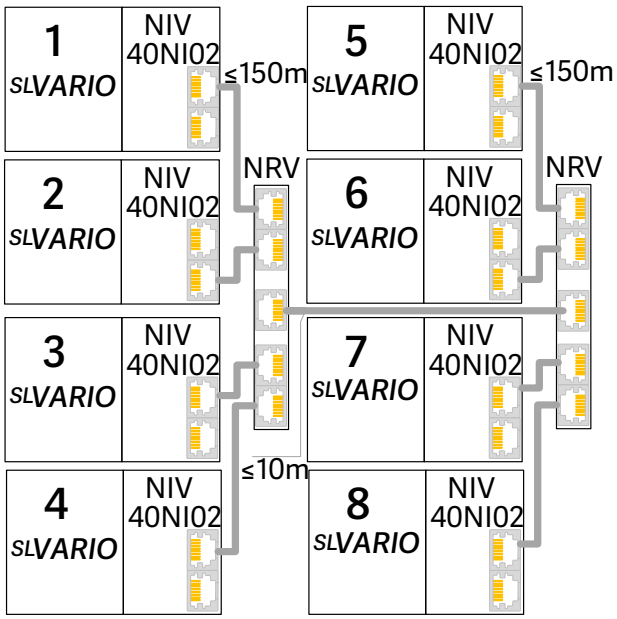
Schematic 2
Using of DNSL-NIV (40NI01, 40NI02) and NRV (40NR01)

Networking up to 5 applications is possible



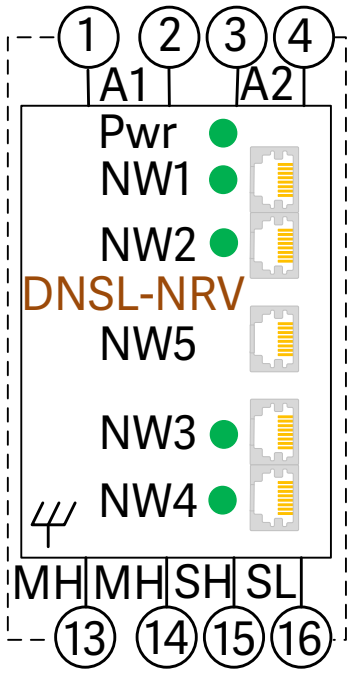
Schematic 1
Using of DNSL-NIV(40NI02) and NRV (40NR01) to

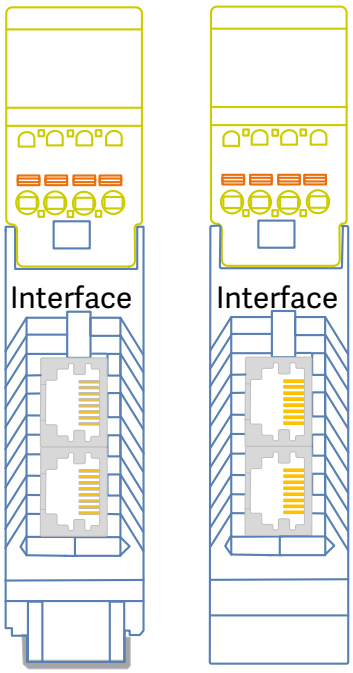
Networking up to 8 applications is possible.



By network modules we recommend the usage of patch cable with plugs from the company Hirose with the ID-no.: TM11AP-88P (61) to ensure the quality.

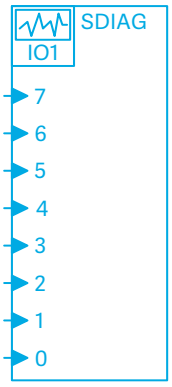
10.3 RJ45 Female connection schematic, front and side view





	Connector to earth via DIN rail

11 Diagnostics module DNSL-DMV

Designer Symboles	Terminal			
	Single	Twin		
	ID-No.:	**ID-No.:**	**Terminals**	**Description**
	40DM01	40DM21	A1/ A2	Power supply 24V DC (A1: 24V, A2: 0V)
3x available 	Front view 		Rx	Serial data terminal to connect with IO1-terminal at central module. The maximal wire length is 100m.
			SW	This terminal has to be connected with Rx-terminal if power supply is not available. In this case the module will be supplied Rx-terminal. (single-wire-function mode) The A2-terminal has to be connected to 0V or earth. A1/ A2 is used to supply the module if power supply is available. The SW-terminal remains disconnected.
			P1	An activation of this terminal (24V DC) mirrors the valence of the LED SC10–SC17 and SC20-SC27 (hexadecimal display) The outputs O1-O2 are independent of this displaying.
			P2	An activation of this terminal (24V DC) displays the switching status of the outputs using the LED SC20-SC27. The LED are green if the outputs are switched on.
			P3, P4	Reserved for future functions
			O1-O8	Diagnostics outputs positive switching to transfer switching status of SL VARIO to a higher control. Switching current, power supply via Rx-terminal: ≤ 10mA Switching current, power supply via A1/ A2-terminals: ≤ 200mA

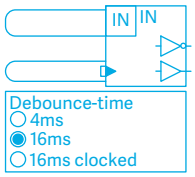
11.1 DNSL-DMV usage

- DNSL-DMV can be used as a Diagnostics module for SL VARIO mounted another place with IP54 environment.
- The actuation of data for LED display and outputs is available every second.
- Using the interface (IO1-terminal) at the central module the switching status data can be transferred to the Rx-terminal at DNSL-DMV.
- The switching status of SL VARIO can be displayed via the LED block SC10-SC17 and SC20-SC27 and by means of the outputs O1-O8 can be transferred to a higher control.
- The configuration of these functions taken place at the Designer (single wire-function mode.
- For this there are 3 elements available each with 8-bit length. (SDIAG1, SDIAG2 and SDIAG3)
- The central module recognizes the configuration of (SDIAG 1-DIAG3) in the Designer and switches the IO1-terminals to a serial Interface output to transfer diagnostics data.
- In the symbol every diagnostics bit-input can be described.
- The Designer button (1 wire diagnostics) must be activated if the module is supplied by Rx-terminal. Then it is active for all 3 elements.
- SDIAG1/ SCI0-SCI7 control LED block SC10-SC17
- SDIAG2/ SCI0-SCI7 control LED block SC20-SC27
- SDIAG3/ SCI0-SCI7 control the outputs O1-O8

11.2 DNSL-DMV display

- LED SC10-SC17 and SC20-SC27 are green when the related bit at the Designer symbol is active.
- LED Rx is flashing green during data reception, always green when the voltage 24V is constantly connected to the Rx-terminal and dark without any signals at Rx-terminal
- LED A1 is green if the power supply is available.
- LED S1 and S2 are reserved for future functions.

• Inputs for safety functions
The following table shows SL VARIO modules with their available inputs (I) and in- outputs (IO).
These can be used for different safety and not safety relevant functions.

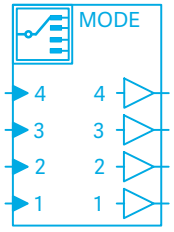
Module s DNSL	Inputs																In-, outputs				Designer Symbol
ZMV / ZMVA	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16	IO1	IO2	IO3	IO4	
ZMVD /ZMVK	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16	IO1	IO2	IO3	IO4	
ZMVD	I17	I18	I19	I20	I21	I22	I23	I24	I25	I26	I27	I28	I29	I30	I31	I32					
ZMVD	I33	I34	I35	I36	I37	I38	I39	I40	I41	I42	I43	I44	I45	I46	I47	I48					
INV	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12					IO1	IO2	IO3	IO4	
DSV / DSV2	I1	I2	I3	I4	I5	I6	I7	I8													
DSIV	I1	I2	I3	I4	I5	I6	I7	I8													
DRV	I1	I2	I3	I4	I5	I6	I7	I8													
SIV	I1	I2	I3	I4	I5	I6	I7	I8													
IOV / RMV	I1	I2	I3	I4	I5	I6	I7	I8													
Feldbusse	I1	I2	I3	I4	I5	I6	I7	I8													
NIV	I1	I2	I3	I4	I5	I6	I7	I8													

11.3 Analogue inputs at the central module

- I1 to I8 safe inputs for safety shutdown mats
- I1 to I8 safe analogue inputs for 0 to 10V
- I1 to I8 safe analogue inputs for 4 to 20mA

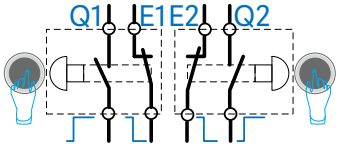
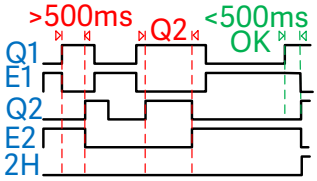
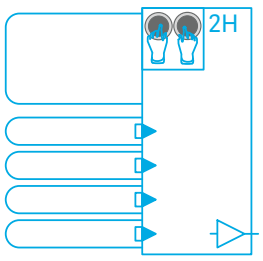
11.4 Inputs for function mode selection switch (FMSS) at central module

- 2 FMSS functions are at the central module available.
- Any inputs at SL VARIO and internal designer wiring can be used also.
- One switching position can be selected. No output signal if more or none

1 to 4 function mode 2 x available	

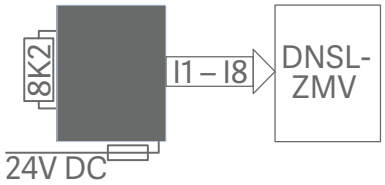
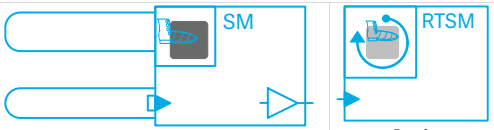
11.5 Inputs for Tow-Hand function according EN 574: Type IIIC

Activate both buttons within 500ms.
Response time: < 50ms

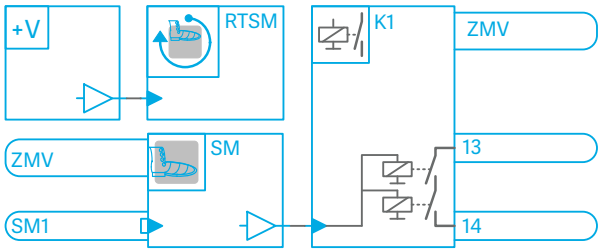
Modules	Terminal				Control	Function diagram	Designer symbol
DNSL-	E1	Q1	E2	Q2			
ZMV / ZMVA	I1	I2	I3	I4			
ZMV / ZMVA	I5	I6	I7	I8			
ZMVD / ZMVK	I1	I2	I3	I4			
ZMVD / ZMVK	I5	I6	I7	I8			
DSV / DSV2	I1	I2	I3	I4			
DSIV	I1	I2	I3	I4			
DRV	I1	I2	I3	I4			
INV / IOV	I1	I2	I3	I4			
RMV	I1	I2	I3	I4			
Field busses	I1	I2	I3	I4			

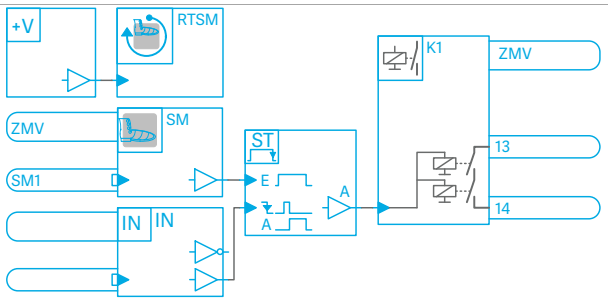
11.6 Inputs for shut down mats, switch rails and bumpers at central module

• Up to eight short generating shutdown mats, switch rails or bumpers can be monitored safely. • The sensors have to be connected to I1-I8 accordingly to the schematic down. • The output SM at the symbol has to be activated via the quit symbol. The quit symbol activate all available shutdown mats.	• • Mix configuration of the inputs I1-I8 is possible. • The reaction time is ≤20ms • Power supply: 24V DC +10%, -15% (PLV) • Safety category 4/ PLe • For other specifications see general technical data

DNSL-ZMV/ ZMVK/ ZMVD	Schematic	Designer Symbols
Powersuply: 24V DC +10%, -15% (PLV) Voltage at I1-I8 Sensor active: 9.5V-14V Sensor free: 11.5V by 24V DC Sensor s: 24V	Mat, switch rail, bumper 	

Statically Quit via the Designer	Manual Quit via the Designer
24V-element (+V) → Quit element (RTSM) Mate input (SM1) → switch output (K1)	24V-element (+V) → Quit element (RTSM) (SM1) and (IN9.Quit) → Starter element (SE1) Starter Element (SE1) → switch output (K1)





11.7 Important notes with using of shutdown mats, switch rails and bumpers

- The unit may only be installed and operated by those who are qualified electrical engineers or have received sufficient training and are familiar with both these instructions and the current regulations for safety at work and accident prevention.
- At begin of the implementing and in frequently time distance the necessary checks (function, status, rating and arrangement) must be undertaken of the user depending of the signal generator at the safety device.
- The safety function must be required every month if there is performance level (e) and every year if there is PLd is required by using contact outputs.
- The maximal length of the connection wire is depended of the environment and the cross section of the wire. Recommended maximal length 100 m
- The minimal safety distance of the signal generator of the protection device has to be determined according of DIN EN ISO 13855.
- The details in the instruction manual of the used signal generator must be considered and observed.
- Function parameters of the signal generator and control unit must be observed.
- Only signal generators with minimum 500.000 switch cycles respectively switch rails with minimum 11.000 switch cycles can be used.
- The contact load of the switch device outputs is to determinate according part: 17.5, page 38 to arrive the necessary switch cycles.
- The reaction time of the whole system is to consider.
- At the end of the service life the units have to be replaced.
- The replaced units have to be properly disposed.
- Faults and diagnostics via switching status LED (page 12), the online diagnostics via the USB interface at the control unit.

Follow details have to be considered:
Safety regulation and important notes and validation (page 7), general technical data (page 37 and 38), details in the Instruction manual of SL VARIO Designer

11.8 Inputs for Safety circuits (SC) with manual Quit

Safety circuits (SC) / input (I)

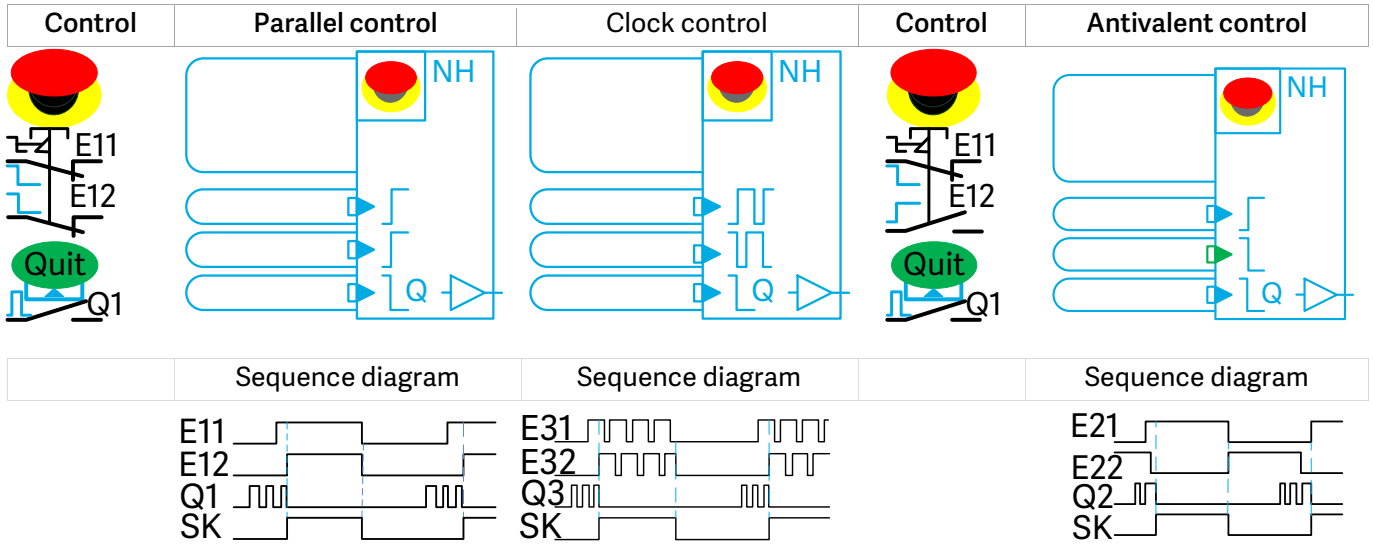
Module	SC1			SC3			SC5			SC7		
DNSL-ZMV/ A / D/ K	I1	I2	I3	I5	I6	I7	I9	I10	I11	I13	I14	I15
DNSL-INV	I1	I2	I3	I5	I6	I7	I9	I10	I11			
DNSL-DSV/ DSV2	I1	I2	I3	I5	I6	I7						
DNSL-DSIV/ DRV/ SIV	I1	I2	I3	I5	I6	I7						
DNSL-IOV/ NIV/ RMV	I1	I2	I3	I5	I6	I7						
Field bus	I1	I2	I3	I5	I6	I7						

Module	SC8			SC9			SC10			SC11			SC12		
DNSL-ZMVD	I17	I18	I19	I20	I21	I22	I23	I24	I25	I26	I27	I28	I29	I30	I31

Modul	SC13			SC14			SC15			SC16			SC17		
DNSL-ZMVD	I33	I34	I35	I36	I37	I38	I39	I40	I41	I42	I43	I44	I45	I46	I47

Example for emergency stop function with manual Quit

The control happens: parallel static, parallel via clock signal from *SL VARIO* or static antivalent.



Clock: see SL VARIO outputs for clock.

11.9 Inputs for Safety circuits (SC) with Quit via Q

- The quit signal is created in the Designer and wired to Q-input at the symbol.
- The quit signal happens via a terminal input, input at the field bus or a virtual output.

Safety circuits (SC) / input name (Q) / input (I)

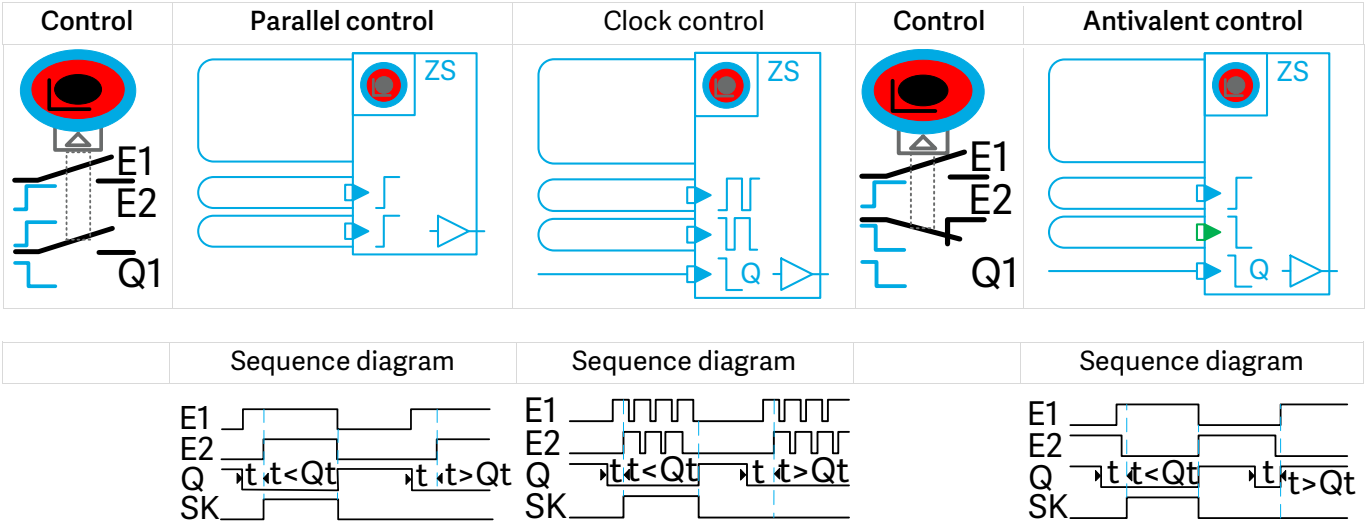
Module	SC1			SC2			SC3			SC4			SC5			SC6			SC7			SC8		
DNSL-ZMV/ A / D/ K	I1	I2	Q	I3	I4	Q	I5	I6	Q	I7	I8	Q	I9	I10	Q	I11	I12	Q	I13	I14	Q	I15	I16	Q
DNSL-INV	I1	I2	Q	I3	I4	Q	I5	I6	Q	I7	I8	Q	I9	I10	Q	I11	I12	Q						
DNSL-DSV/ DSV2	I1	I2	Q	I3	I4	Q	I5	I6	Q	I7	I8	Q												
DNSL-DSIV/ DRV/ SIV	I1	I2	Q	I3	I4	Q	I5	I6	Q	I7	I8	Q												
DNSL-IOV/ NIV/ RMV	I1	I2	Q	I3	I4	Q	I5	I6	Q	I7	I8	Q												
Field bus	I1	I2	Q	I3	I4	Q	I5	I6	Q	I7	I8	Q												

Module	SC9			SC10			SC11			SC12			SC13			SC14			SC15			SC16		
DNSL-ZMVD	I17	I18	Q	I19	I20	Q	I21	I22	Q	I23	I24	Q	I25	I26	Q	I27	I28	Q	I29	I30	Q	I31	I32	Q

Modul	SC17			SC18			SC19			SC20			SC21			SC22			SC23			SC24		
DNSL-ZMVD	I33	I34	Q	I35	I36	Q	I37	I38	Q	I39	I40	Q	I41	I42	Q	I43	I44	Q	I45	I46	Q	I47	I48	Q

Example for permission function <u>with</u> quit via Q-input

The control happens: parallel static, parallel via clock signal from *SL VARIO* or static antivalent.



Qt: E1 and E2 have to be activated within 500ms.
Clock: see SL VARIO outputs, clock outputs

11.10 Quit of safety circuit (SC)

- Selection „with falling edge“: The quit signal has to have change ⌊ independent from the source.
- Selection „with High level “; The quit signal can be permanent independent from the source.
- The quit buffer time can be 500ms or no buffer.
- Selection at the Designer for test of SC after Pwr-ON:

Needed: a switch OFF/ ON of the safety circuit
Needless: a switch OFF/ ON of the safety circuit

11.11 Inputs for Safety circuits (SC) without Quit

Safety circuits (SC) / input (I)

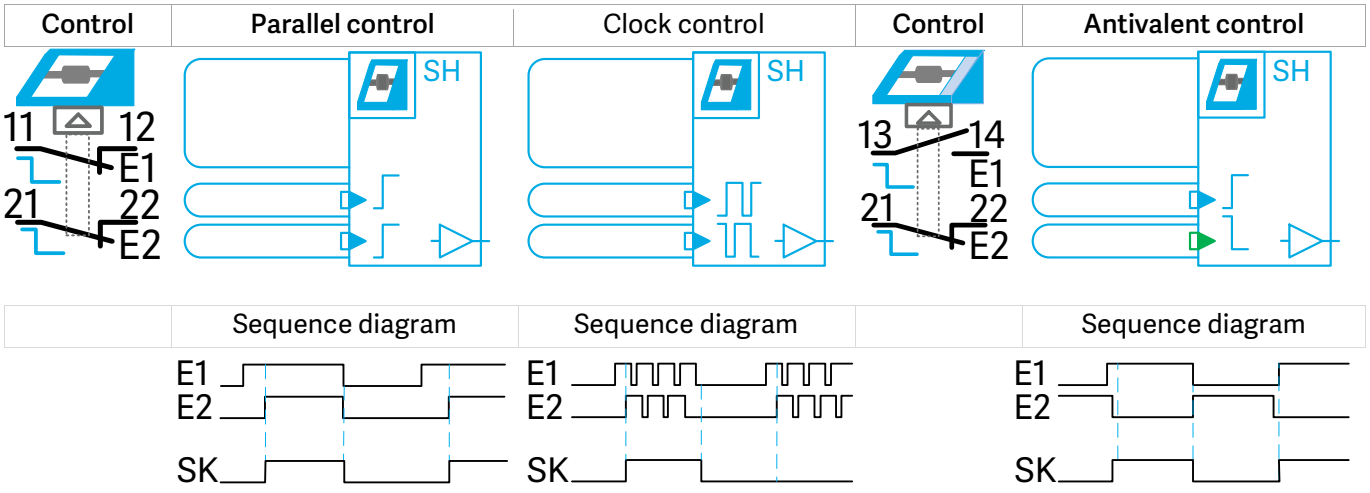
Module	SC1		SC2		SC3		SC4		SC5		SC6		SC7		SC8	
DNSL-ZMV / A / D / K	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16
DNSL-INV	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12				
DNSL-DSV/ DSV2	I1	I2	I3	I4	I5	I6	I7	I8								
DNSL-DSIV/ DRV/ SIV	I1	I2	I3	I4	I5	I6	I7	I8								
DNSL-IOV/ NIV/ RMV	I1	I2	I3	I4	I5	I6	I7	I8								
Field bus	I1	I2	I3	I4	I5	I6	I7	I8								

Module	SC9		SC10		SC11		SC12		SC13		SC14		SC15		SC16	
DNSL-ZMVD	I17	I18	I19	I20	I21	I22	I23	I24	I25	I26	I27	I28	I29	I30	I31	I24

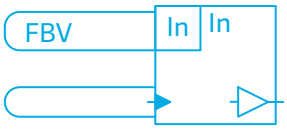
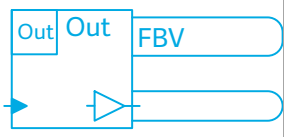
Module	SC17		SC18		SC19		SC20		SC21		SC22		SC23		SC24	
DNSL-ZMVD	I33	I34	I35	I36	I37	I38	I39	I40	I41	I42	I43	I44	I45	I46	I47	I48

Example for safe cover without Quit

The control happens: parallel static, parallel via clock signal from *SL VARIO* or static antivalent.



12 Data in- and outputs at the field bus

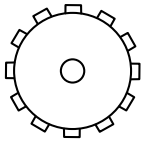
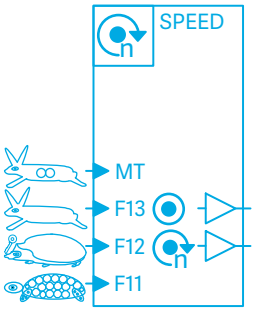
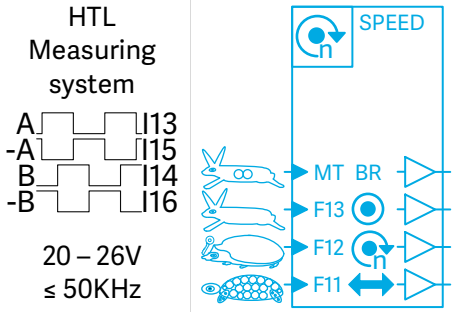
Module	Input data		Designer Symbol		Output data		Designer Symbol
DNSL-COV DNSL-DPV DNSL-ECV DNSL-EPV DNSL-MOV DNSL-PLV DNSL-PNV	FBI1.1 - FBI1.8 ▼ FBI4.1 - FBI4.8	IN		Out	FBO1.1 - FBO1.8 ▼ FBO16.1 – FBO16.8		

13 Inputs for standstill and speed monitoring

13.1 Inputs for standstill and speed monitoring at the central module

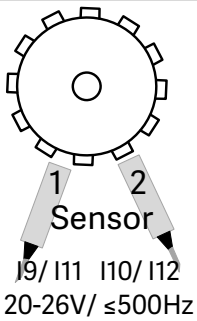
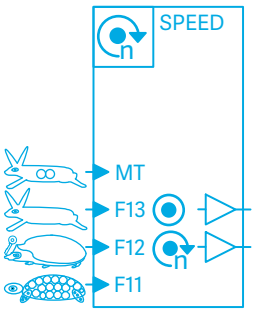
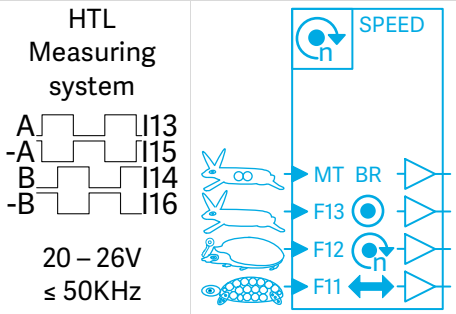
Example 1:

- 4 one-channel monitoring each with one sensor
  sensor of first monitoring connected to I9, second to I10, third to I11 and forth to I12
- Monitoring of standstill and speed in different operating modes.
- One safe monitoring with a HTL incremental measuring system connected to the inputs
  A to I13, -A to I15, B to I14 and –B to I16
- Monitoring of standstill, speed, position, direction and break in different operating modes is possible.
  ID-No.: 40ZM03, 40ZM23, 40ZM04, 40ZM 24 only
- One-channel symbol is the left corner green, safe yellow

Gear/ Sensor	One-channel monitoring (1 – 4)		Safe monitoring (5)	Functions
		Standstill Speed		Brake Standstill Speed Direction

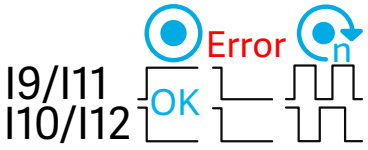
Example 2

- 3 safe standstill and speed monitoring
- One safe monitoring with 2 sensors connected to the inputs I9 and I10.
- One safe monitoring with 2 sensors connected to the inputs I11 and I12.
- Monitoring of standstill and speed in different operating modes is possible
- Mix one-channel and safe monitoring is possible.
- One safe monitoring using a HTL incremental measurement system connected to the inputs
  A to I13, -A to I15, B to I14 and –B to I16. (20-26V/ 50KHz), ID-No.: 40ZM03, 40ZM23, 40ZM04, 40ZM 24 only
- Monitoring of standstill, speed, position, direction and break in different operating modes is possible

Gear/ Sensor	Safe monitoring (1 and 2)		Safe monitoring (3)	Functions
		Standstill Speed		Brake Standstill Speed Direction

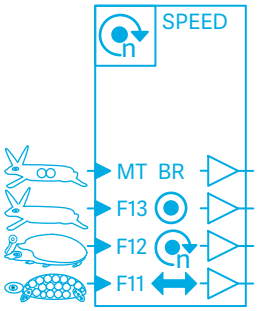
13.2 Requirements for the sensors for safe monitoring

- Two sensors for every monitoring
- At the cogwheel one sensor opposite to cog other to gap
- During standstill at least one sensor has 24V signal.
- The function of the sensors is permanently monitored.



Example 3

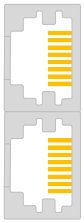
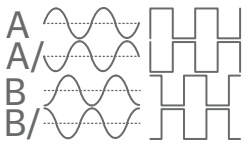
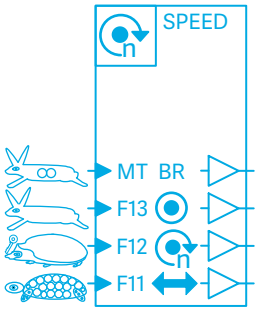
- One safe monitoring via an incremental HTL measuring system connected to the inputs A to I9, -A to I11, B to I10 and -B to I12. ID-No.: 40ZM03, 40ZM23, 40ZM04, 40ZM 24 only
- One safe monitoring via an incremental HTL measuring system connected to the inputs A to I13, –A to I15, B to I14, and -B to I16. ID-No.: 40ZM03, 40ZM23, 40ZM04, 40ZM 24 only
- Standstill, position, direction, speed, and break can be monitored in different operating modes,

	HTL-Measuring systems	Monitoring 1 and 2	Functions
	A I9 -A I11 B I10 -B I12 A I13 -A I15 B I14 -B I16 20 – 26V/ ≤ 50KHz		Brake Standstill Speed Direction

13.3 Inputs for standstill and speed monitoring at the central module DNSL-ZMVD

- The central module ZMVD is available with two version one with additional four monitoring (ID-No: 44ZM01) the second with eight monitoring (ID-No: 48ZM01).
- These are mounted at the left side of the central module.
- Standstill, speed, position, direction and brake in different function modes can be monitored.
- For every monitoring an incremental measuring system is necessary.
- Sinus/ Cosine or TTL signals are possible. HTL signals are possible using DINA HTL-cable adapter
- The connector plugs for measuring systems are on the upper and lower side of the unit.
- For every monitoring is one connector plug available.

Standstill and speed monitoring with DNSL-ZMD

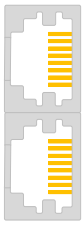
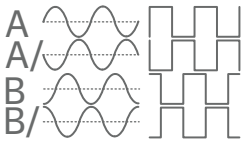
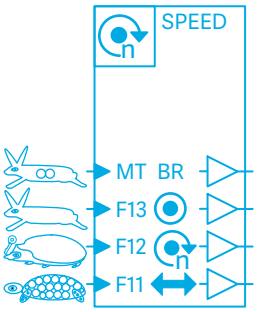
Measuring system connections	Sin/ Cos 1Vss or TTL 1-5V signals	Monitoring 1 to 8	Functions
 4 x RJ45 female plug 8x RJ45 female	Measuring system  ≤ 400KHz ID-No: 44ZM01 width: 67,5mm 4 monitoring ID-No: 48ZM01 width: 90mm 8 monitoring		Brake Standstill Speed Direction

	MT: non monitored automatic function mode F13: monitored automatic function mode F12: monitored semi-automatic function mode F11: monitored tool-setting function mode

13.4 Input for safe standstill and speed monitoring at DNSL-DSV and DSV2

- Two safe monitoring are available.
- For every monitoring an incremental measuring system sinus / cosine or TTL signals is necessary.
- Standstill, position, direction, break and speed monitoring in different operating modes are possible.

Measuring system inputs	Usage example	Function modes	Monitoring 1 and 2

Measuring system connections	Sin/ Cos 1Vss or TTL 1-5V signals	Monitoring 1 and 2	Functions
 Rj45 female plug	 ≤ 500KHz		Brake Standstill Speed Direction

13.5 Requirements of the incremental measuring system

Standard Sin / Cos or TTL measuring system	Standard HTL measuring system via cable adapter
• Amplitude 1Vpp sinus / cosine or TTL • Encoder frequency ≤ 500KHz • 2 tracks, 90° phase offset, per track 2 signals, 180° phase shifted • A direct connection between motion monitoring and measuring system is required	• Amplitude 18 to 26V square wave. • Encoder frequency ≤ 500KHz • 2 tracks, 90° phase offset, per track 2 signals, 180° phase shifted • System without negated signals is possible. • A direct wire connection between motion monitoring and measuring system is required.

13.6 Two sensors measuring system with DNSL-DSV

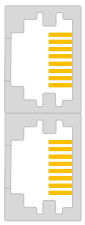
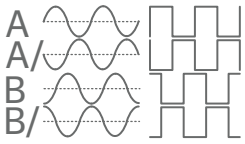
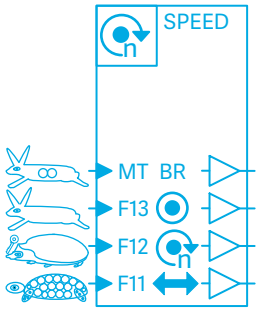
- For every monitoring 2 positive switching sensors with antivalent signals.
- The signals of the sensors have to be connected to the RJ45 plugs at the monitoring module.
- The connection happens via two cable adapters type DNRJ45 HTL-SL.
- For the monitoring of the direction a time pitch between the impulse edges of both signals is necessary for the whole speed range. This must be considered for the mounting of the sensors.
- Time pitch and duty cycle value are not relevant.
- After power-on the LR-signal is indefinite.
- Usage of sensors with one output is possible. Here is a monitoring of the direction not possible.

13.7 Ramp monitoring with DNSL-DSV and DSV2

- The output (SAR/ BR) at the symbol is to use for the ramp monitoring of an axle.
- The speed reduction in rotation/s2 respectively meter/s2 and the sample rate is adjustable at the Designer.
- The sample rate is selectable 10-150ms in 10ms steps.
- Without selection is the output (BR) low.
- During speed reduction ≥ selection is (BR) high.
- During speed reduction < selection is (BR) low.
- Outputs at SL VARIO can be triggered via SAR outputs.

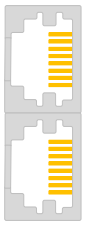
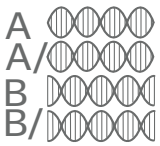
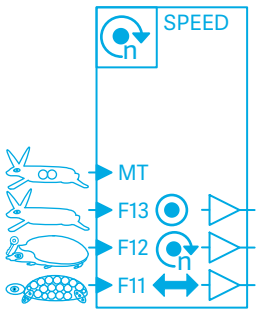
13.8 Inputs for standstill and speed monitoring at DNSL-DSIV

- Two safe monitoring are available.
- For first monitoring an incremental measuring system with sin/ cos 1Vss or TTL signals is used.
- For the second monitoring a SSI interface measuring system is necessary.
- A comparator function is available between the first and the second monitoring.
- Standstill, position, direction, break and speed monitoring in different operating modes are possible.
- For ramp monitoring see Designer instruction manual.

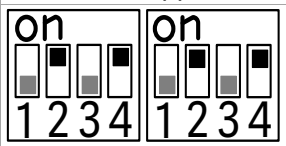
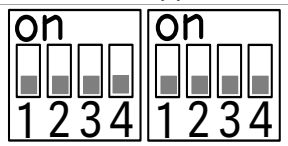
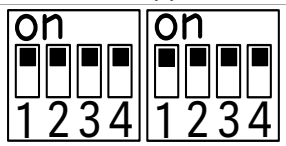
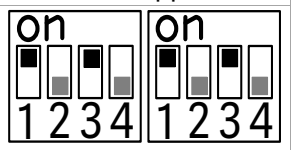
Measuring system connections	Sin/ Kos 1Vss or TTL 1-5V signals	Monitoring 1 and 2	Functions
 Rj45 female plug	 Measuring system 1: ≤ 500KHz Measuring system 2: SSI interface		Brake Standstill Speed Direction

13.9 Input for standstill and speed monitoring at DNSL-DRV

- Two safe monitoring with resolver measuring systems.
- For every monitoring one system is necessary.
- Standstill, position, direction, break and speed monitoring in different operating modes are possible.

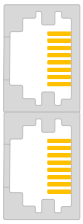
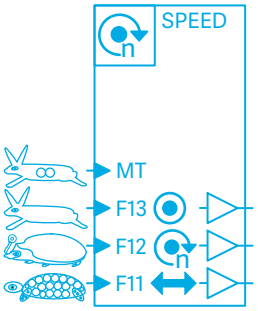
Measuring system connections	Resolver Measuring systems 1 - 10V	Monitoring 1 and 2	Functions
 Rj45 female plug	 ≤ 1200Hz		Standstill Speed Direction

Setting of the resolver amplitude at DNSL-DRV
The setting of both DIP switches is identical.

Amplitude	1-2Vpp	2-4Vpp	4-8Vpp	8-10Vpp
Adjustment				

13.10 Inputs for standstill and speed monitoring at DNSL-SIV

- Two monitoring with SSI interface measuring system.
- For every monitoring one system is necessary.
- Standstill, position, direction, break and speed monitoring in different operating modes are possible.

Measuring system connections	SSI-interface measuring systems	Monitoring 1 and 2	Functions
 Rj45 female plug			Standstill Speed Direction

	MT: non monitored automatic function mode F13: monitored automatic function mode F12: monitored semi-automatic function mode F11: monitored tool-setting function mode

13.11 Direction monitoring with DSV, DSV2, DSIV, DRV und SIV

- The virtual outputs (SDI ↔) at the Designer can be used to monitor the direction of an axle.
- SDI has high signal during standstill and while sinus is advanced. Low signal if cosine is advanced.
- The preferred direction can be selected via hardware inputs and logic elements.

13.12 Quit of speed monitoring

- After an over speed the output (SSM) has a high signal.
- After a quit via the input ( RTDS) is a high signal at the output (SSM) if the actual speed is lower than the selected.
- SSM changes to low signal with movement if no operating mode is selected.
- Selection of the operating modes happens via hardware terminal.
- To control the terminals permission-switch unit can be used as inching mode, permission key or safety cover contact

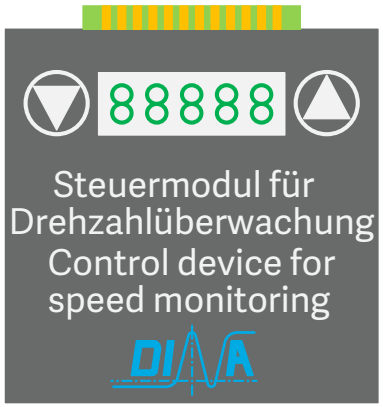
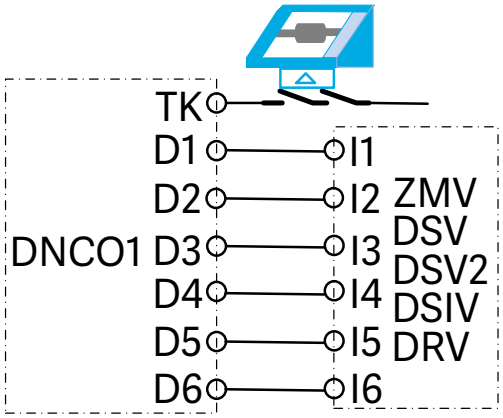
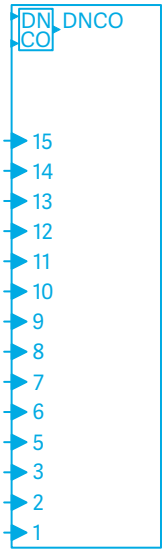
13.13 DNCO function to monitor the Peripheral speed

16 monitored speeds				64 monitored speeds					
I1	I2	I3	I4	I1	I2	I3	I4	I5	I6

- The DNCO function by DNSL-DSV, DSV2, DRV and the central module enables the monitoring of the peripheral speeds of machined parts or tools.
- 16 different speeds for two monitoring and for every operating mode or
- 64 different speeds for two monitoring during the automatic mode.
- The speeds can be entered in two frequency tables at the Designer.
- The selection of the monitored speeds happens via the bit code wiring of the terminal inputs.
- 4 inputs enable to monitor 16 speeds in all operating modes. For up to 64 speeds 6 inputs are required.
- The DNCO1 unit can be used to set these inputs.

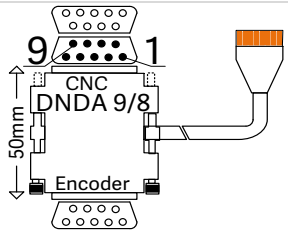
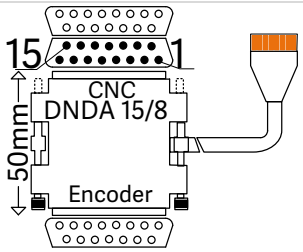
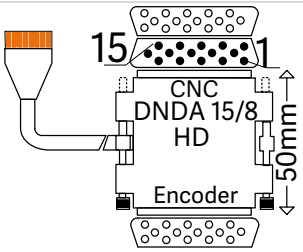
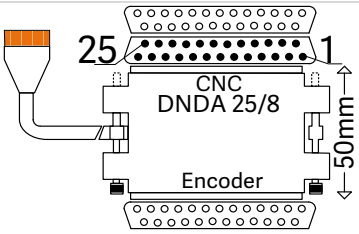
13.14 Selection of DNCO-Multiplexer

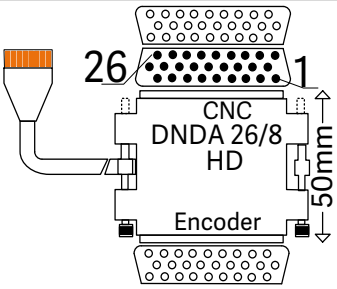
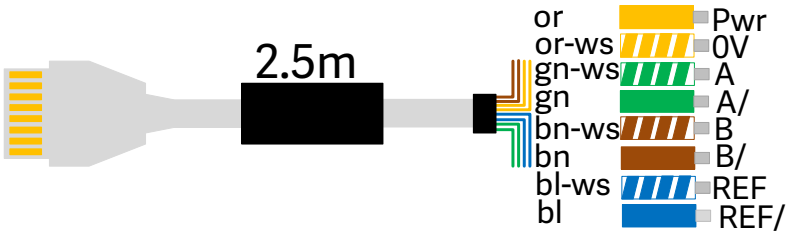
- The configuration requires logic operations to select the frequencies in the table in the Designer.
- The logic operations can be process-related. In this case no terminal inputs are necessary.
- A DNCO-multiplexer is available for every frequency table. 16 frequencies can be selected via a multiplexer.
- The cell 00 in the table is selected if all inputs are not activated.
- The cells 01 to 15 are selectable via the input 1 to 15 at the DNCO-multiplexer.
- The first monitoring is paired with DNCO1 the second with DNCO2

DNCO1	DNCO1 connection schematic	Multiplexer 1 and 2
		

14 Cable adapter DNDA

The DNDA is used as an interconnection between the measuring system of the axle and the speed monitoring system. It is available for all CNC variations. See instruction manual cable adapter.

DNDA 9/8	DNDA 15/8	DNDA 15/8 HD	DNDA 25/8
			

DNDA 26/8 HD	DNRJ45 HTL-SL DNRJ45-HTL-SL is using with incremental HTL-Measuring systems
	ID-No.: 95RJ20 

15 Outputs at SL VARIO

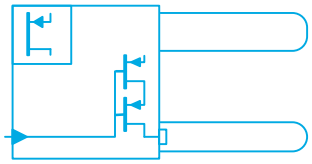
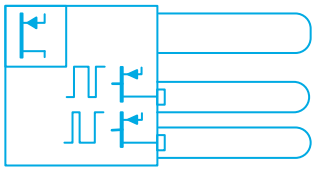
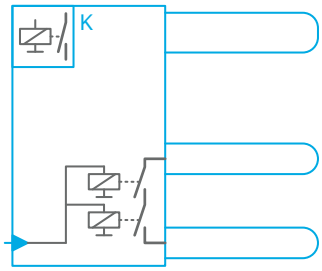
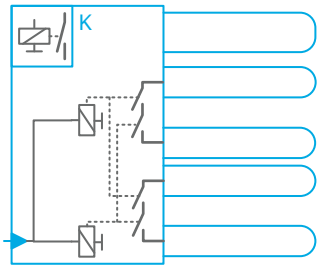
Short-circuit-proof positive switching semiconductor outputs

DNSL-		Switch current	P-Level	Description
ZMV / ZMVA / ZMVD / ZMVK	A1 O1-O6	1A, ∑3A	PLe	6 safe outputs O1, O2 monitored current
ZMV / ZMVA / ZMVD / ZMVK	IO1-IO4	0.1A ∑0.4A	PLe	4 clock outputs 4 safe outputs 4 safe digital inputs
DSV / DRV	P O1/ O2	0.25A ∑0.4A	PLc	2 clock or switching outputs
DSV / DRV	P O3-O7	1A ∑2.5A	PLe	5 safe outputs O1, O4 also clock outputs
DSV2 / DSIV / IOV	P O1-O7	1A ∑3.5A	PLe	7 safe outputs O1-O4 also clock outputs
SIV / NIV	A1 IO1-IO4	1A ∑2A	PLd	4 safe outputs
INV	P IO1-4	0.1A	PLe	4 safe or clock outputs

Safe contact outputs

DNSL-		Switch currant	P-Level	Description
ZMV / ZMVA / ZMVD / ZNVK	K1 13 14 K2 23 24	≥10mA ≤6A ∑K1+K2: 6A	PLe	2 safe NO contact DC13: 24V/ 2A AC15: 230V/ 3A 40ZM31/ 32 not available
ZMVK	K3 33 34 43 44 K4 53 54 63 64 K5 73 74 83 84 K6 93 94 103 104	≥10mA ≤6A ∑K3+K4: 6A ∑K5+K6: 6A	PLe	Output extension 4 outputs each 2 safe NO contacts DC13: 24V/ 5A
DNSL-RMV	K1 13 14 23 24 K2 33 34 43 44	≥10mA ≤6A ∑K1+K2: 6A	PLe	2 outputs each 2 safe NO contacts DC13: 24V/ 4A AC15: 230V/ 3A

Outputs

Safe output	Clock output	Safe contact output	Safe contact outputs
			

The configuration of the outputs happens at Designer.
A lot of diagnostics functions are available. This is useful for the setting-up operation and debugging.

16 General technical data

16.1 Electrical characteristics

Operation voltage via A1, A2 at ZMV, ZMVK	24V DC, -15% + 10% for all modules, ≤10% Ripple
Input current at A1	≤ 4A / internal fuse: 6A

DNSL-	ZMV	ZMVA	ZMVD	ZMVK	DSV	DSV2	DSIV	DRV
Power consumption in W	2.9	3.0	3.0	7.7	2.5	2.5	2.5	2.5
Wight in g	350	450	450	570	130	130		130

DNSL-	SIV	INV	IOV	CMV	NIV	NRV	RMV	Feld Bus
Power consumption in W	2.2	1.7	2.2	0.5	2.2	0.5	4.8	1.0
Wight in g	130	130	130	130	130	130	140	130

16.2 Environment conditions

Operating temperature: -10 +55°C	Storage temperature: -40 +85°C
High of usage location	2000m over sea level
Vibration resistance 3 axle Shock resistance 3 axle for output relay	Sinus 10–55Hz, 0,35mm, 10 cycles, 1 octave /min ≤ 5g, 11ms
Max. cable cross section	0,25 - 2,5mm² with wire end sleeve
Terminal	Spring load clamps, pluggable
Connection wire	60/75°C copper only
Housing material	Polyamide PA unreinforced
Protection class	Installation in a closed cabinet with ≥ IP 54
Voltage at the inputs by shutdown mat	I1 to I8: 9.5 to 14V, 11.5V with 24V shutdown mat voltage
Reaction time by shutdown mat	< 20ms
Voltage at the inputs	24V DC –15%, + 10%
Input current consumption	Max. 4mA
Input voltage terminal(P) at DSV, DRV, SIV, IOV, NIV	24V DC -15% + 10%
Input current terminal(P) at DSV, DRV, SIV, IOV, NIV	≤ 4A
Input frequency at I9 – I12 at central module	≤ 1200Hz HTL-signals via as example proximity switches
Input frequency at I9 – I16 at central module	≤ 50KHz HTL-signals via incremental measuring system
Input frequency Encoder 1 and 2 at DNSL-DSV	≤ 500KHz Sin / Cos 1Vpp or TTL signals
Input frequency resolver 1 and 2 at DNSL-DRV	≤ 1200Hz Sin/ Cos 1 to 10Vpp
Input signals at DNSL-SIV	SSI interface signals
Accuracy of the analogue inputs	± 3% of the maximal input value over -10 to +60°C
Input impedance of the analogue inputs	With 4-20mA ca. 500Ω, with 0-10V > 5KΩ

Remark: current inputs (4-20mA) can be destroyed wit input voltage >12V

16.3 Technical data of the Semiconductor outputs

Technical data Semiconductor outputs	ZMV/ ZMVK		DSV, DRV		INV	IOV	NIV, SIV
Outputs Performance level	IO1 - IO4 PLe	O1 – O6 PLe	O1, O2 PLc	O3 – O7 PLe	IO1 - IO4 PLe	O1 – O7 PLe	O1 – O4 PLd
Schematic of outputs							
Switch and continuous current Ω / L	0,1A	1A	0,25A	1A	100mA	1A	1A
Sum of Switch/continuous current Ω/L	0,4	3A	0,4A	2,5A	0.4A	3,5A	2A
Minimal Switch current Ω / L	1mA	1mA	1mA	1mA	1mA	1mA	1mA

- The power supply of the semiconductor outputs will be disconnected if the terminal A2 is not connected to 0V. Therefor residual voltage at the output loads is not possible.
- All semiconductor outputs are short circuit and overload proof.
- Every output has a recovery diode.

16.4 Technical data of the contact outputs

Technical data contact outputs	DNSL-ZMV/ ZMVK	DNSL-ZMVK	DNSL-RMV
Outputs	K1, K2	K3 – K6	K1, K2
outputs schematic, Performance level: PLe			
Minimum switch current	10mA	10mA	10mA
switch current, 0,1Hz cycles according to DIN EN 60947-4-1/ EN 60947-5-1	DC1: 24V/6A DC13: 24V/2A	DC1: 24V/6A DC13: 24V/5A	DC1: 24V/6A DC13: 24V/4A
switch current according to DIN EN 60947-4-1/ EN 60947-5-1	AC1:250V/6A AC15: 230V/3A		AC1:250V/6A AC15: 230V/3A
Sum of the switch and continuous current	K1, K2: ≤ 6A	K3, K4: ≤ 6A, K5, K6: ≤6A	K1, K2: ≤ 6A
Electrical life DC13: 24V/ 1A	$1.5x10^5$	$1x10^5$	$9x10^5$
Electrical life DC13: 24V/ 4A	10^4	$4x10^4$	$7x10^4$
Electrical life AC15: 230V/ 1A	$2x10^5$		$7x10^5$
Electrical life AC15: 230V/ 2A			$5x10^5$
Mechanical life	> $50x10^6$	> 10^7	> 40 x 10^6
Maxim switch cycles DC13: 4A	360 cycles/h	360 cycles /h	360 cycles /h
Maxim switch cycles AC15: 3A	360 cycles /h		360 cycles /h
Contact fuse	6A slow	6A slow	6A slow
Short circuit strength: Automat safety fuse gG	200A/ B6 800A/ 6AgG	1000A SCPD 6A	200A/ B6 800A/ 6AgG
Rated insulation voltage	250V AC		250V AC
Impulse withstand voltage Use in pollution degree 2 environment.	4KV		4KV
Reaction time, drop out time	15mS/12mS	10mS/ 3mS	10mS

AC1: control of none or low inductive load, AC voltage AC15: control of electro-magnetically load, AC voltage	DC1: control of none or low inductive load, DC voltage DC13: control of electro-magnetically load, DC voltage

16.5 Electrical life of the contact outputs

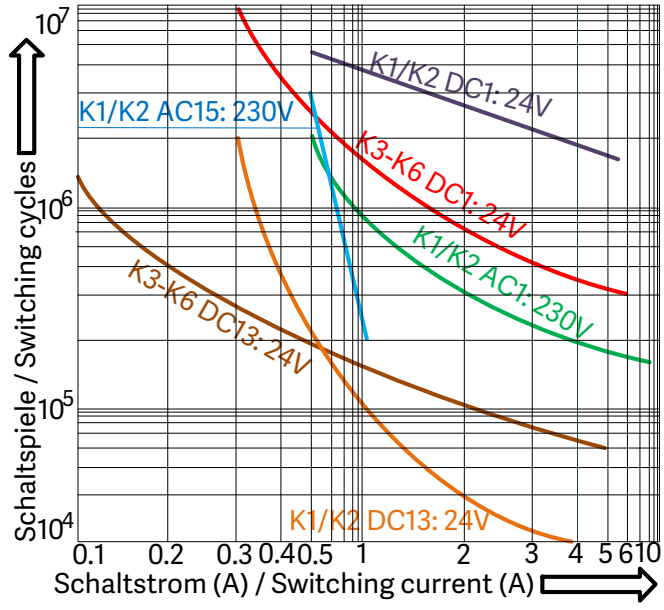
260 Work days / year/ 8h work time/ day/ switch voltage 24V DC

Modules	DNSL-ZMV, ZMVK: K1, K2					DNSL-ZMVK: K3-K6					DNSL-RMV: K1,K2					
Last Art	DC1	DC1	DC1	DC13	DC13	DC1	DC1	DC1	DC13	DC1	DC1	DC1	DC1	DC13	DC13	
Schaltstrom	1.0A	4.0A	6.0A	1.0A	4A	1.0A	4.0A	6.0A	1.0A	4.0A	1.0A	4.0A	6.0A	1.0A	4.0A	Jahre
Schaltspiele/ Stunde	384	192	153	15	1	144	36	29	15	5	769	192	96	91	67	5
	192	96	76	7	0.5	77	17	14	7	2	384	96	48	45	33	10
	96	48	38	3.6	0.25	38	8	7	3.6	1	192	48	24	23	17	20

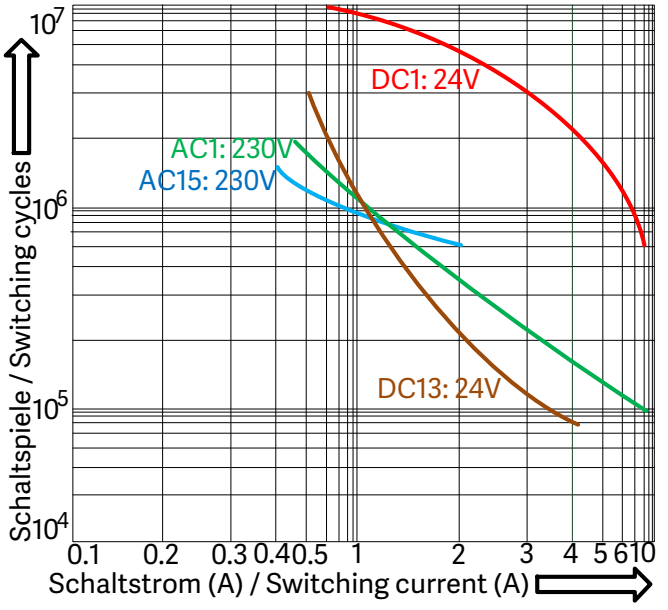
260 Work days / year/ 8h work time/ day/ switch voltage 230V AC

Modules	DNSL-ZMV, ZMVK: K1, K2					DNSL-ZMVK: K3-K6					DNSL-RMV: K1,K2					
Last Art	AC1	AC1	AC1	AC15	AC15	AC1	AC1	AC1	AC15	AC15	AC1	AC1	AC1	AC15	AC15	
Schaltstrom	0.5A	1.0A	3.0A	0.5A	1.0A						0.5A	1A	3.0A	0.5A	2A	Jahre
Schaltspiele/ Stunde	192	96	20	288	20						174	96	20	116	48	5
	96	48	10	144	10						87	48	10	58	24	10
	48	24	5	72	5						44	24	15	28	12	20

DNSL-ZMV/ ZMVK

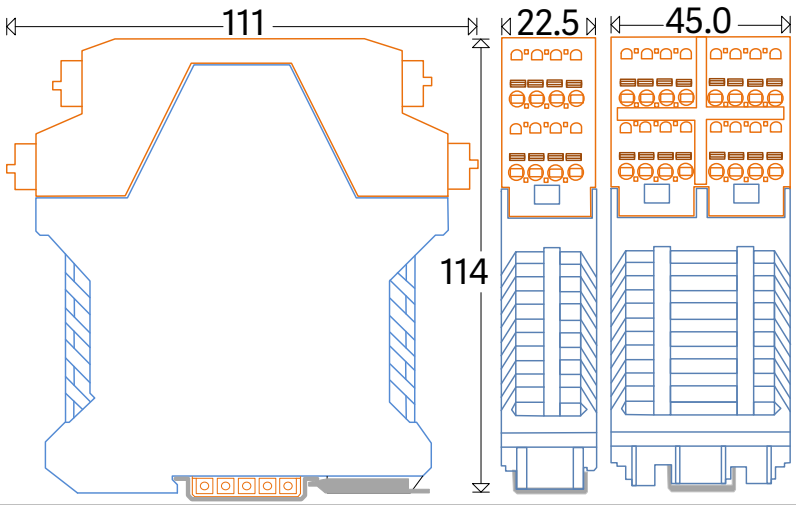


DNSL-RMV



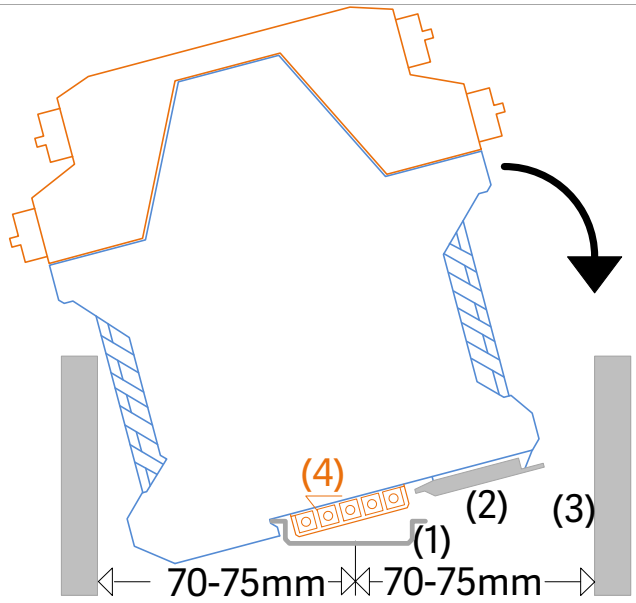
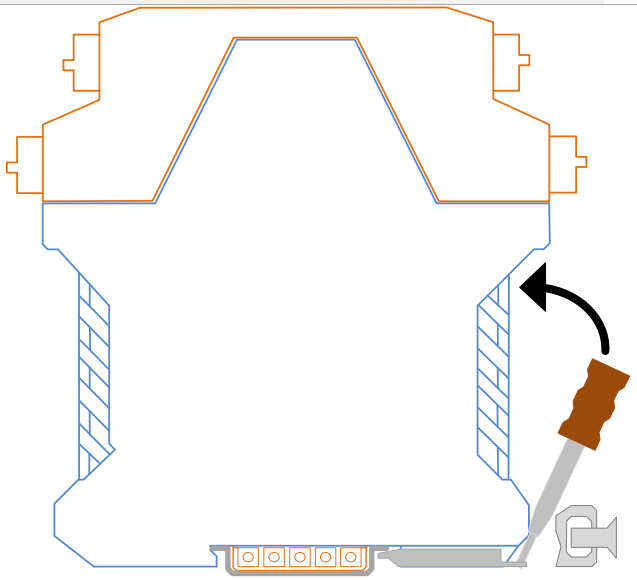
17 Dimensions

DNSL-ZMV: 45mm DNSL-ZMVA/ ZMVK: 67.5 DNSL-ZMVD (44ZM01): 67.5mm/ 48ZM01: 9 mm	All other modules: 22.5mm



DNSL-ZMVD: 67.5 mm with 4 standstill and speed monitoring
90.0 mm with 8 standstill and speed monitoring

17.1 Fitting and remove

Fitting: Plug bus connector at the cap rail. Hook the module up side at the cap rail. Push it down.	**Remove**: Screwdriver to unlock the module from the cap rail. Move the module to the up direction and take it out.
	
Cable channel distance	: Grounding via DIN rail

(1) Bus connector
(2) Cap rail
(3) Locking feeder
(4) Cable channel

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